The Construction Industry in Libya, with Particular Reference to Operations in Tripoli

BY

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Thesis submitted to the Faculty of Humanities and Social Sciences for the Degree of Doctor of Philosophy

University of Newcastle upon Tyne

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June, 2006

Dedication

To my country, Libya which has given me the opportunity to conduct this study, and to the Libyan Construction Industry (LCI) where the researcher learned many practical lessons and the material used in this research and whose development, experience and current operations allowed the ideas and conclusions in this study to emerge and be documented.

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To my father, mother, my wife and my sons and daughters; Abtisam, Rabie, Huda, Kahaula and Mohamed

Declaration: This thesis is based on an original investigation and full acknowledgment of all sources used.

Abstract

This research is concerned with the Libyan construction industry (LCI), which has not been investigated before. Its key aims are to achieve a better understanding of the industry, to identify the key factors which have formed its current status, and to address the major obstacles constraining its operations. Theoretical and empirical studies were conducted between 2002 and 2005 in Libya. The theoretical research focused on the construction industry (CI) and its key issues, while the empirical research was organized around a survey and explored Libya as the context for the study. Owing to geographical and time limitations, the city of Tripoli was employed as the location where the research was conducted. Data was obtained through questionnaires targeting consultants, contractors, and clients, supported by a set of interviews with those concerned, visits to firms and projects under construction, and other supportive techniques. The information gathered was analyzed using SPSS package, Excel Software and SWOT analysis.

The findings of the study indicate that the current shape of the LCI is a consequence of the interaction of geographical, historical, social, political, economic, institutional and technological factors. The industry operates in difficult geographical, social and economic circumstances. Its operations are concentrated in four main separate regions, influenced by social tribalism and nepotism, fluctuations in oil revenues and foreign workers. Political ideology has played a significant role in determining the current status, by imposing partnership principles. Also, the LCI is currently characterized by traditional procurement systems, paper-based and verbal communications systems, and cement- and intensive-labour operations. The study identifies three broad obstacles which restrict the operations of the LCI. These relate to the operating environment, firms, and clients and projects. Unstable regulatory, institutional and economic environments have not given the industry the opportunity to grow and play a significant leading role in economic and development processes. However, the strengths of the industry lie in its educated and experienced staff, the CI is seen as a profitable business, and because demand for construction will flourish in the coming decades. Thus, opportunity to develop the LCI does exist.

Despite the strong commitment of the state to regulate the CI in accordance with formal construction standards, informality is one of the key features of its operations. The informal sector has a key role in production processes and the supply of construction materials and labour. In addition, Libya is a country which suffers from acute shortages in water supplies, and yet the current operations of the LCI are cement based and designed around mixing methods on construction sites in which water is an important issue in terms of quantity, quality and management. This thesis suggests that the position of water in the operations of the CI in arid and semi-arid countries should be investigated in specific further research. The levels of oil revenues, investment in construction, the ability to create an enabling environment, the roles of the private sector and foreign firms, and the relationship between the formal and informal sectors, are likely to determine the industry's future shape, operations and ability to cope with changes. However, without improving management capability of the LCI, the industry will not be able to cope with future challenges, and no significant advance can be made in its operations. Furthermore, the implications of the study's findings and recommendations for future research are suggested, including the water issue and the informal construction industry in Libya.

Acknowledgements

First and foremost, I give thanks to God for all the care and help offered throughout the different phases of this research. Many people, government departments and institutions are important contributors to this work. It is difficult to name all those who have provided help, support, encouragement, information and advice. The author warmly thanks all those individuals, institutions, firms, and many others who have made available to this research their documents, notes, time, knowledge and expertise. Without their assistance, this research would not have been possible.

The author would like to express special thanks to his supervisors, Dr Graham Tipple and John Kamara, for their inspirational guidance, consistent patience, encouragement, friendship and constructive criticism. Throughout the course of this research many ideas and concepts emerged during our meetings and discussions. The researcher gratefully acknowledges that their vital academic tutorials, encouragement and comments were crucial factors in the compilation of this work. The author is in debt to them for their moral support and encouragement throughout all phases of the research process. Also, grateful thanks go to Dr Lorna Darcan, Dr Stuart Cameron, Dr Nathaniel Colemon and Dr David Wood for their feedback in the early stages of the research. Special thanks go to MRs Suzanne Speak for her help to developing the questionnaires used in the study and Dr Simon Kometa at the University of Newcastle upon Tyne who made available to the researcher his knowledge and experience of SPSS, and provided valuable help and advice concerning the statistical tests used in this study.

The author would also like to express special thanks to many institutions, corporations, consultancy and construction firms, clients of projects and individuals in Libya for their co-operation throughout this research. Thanks go to those key managers, decision makers and other staff in the LCI and its associated sub-sector, the General Council for Planning (GCP), General People's Committee (GPC), General People's Committee for Planning (GPCP), the General People's Committee for Popular Broad Control (GPCPBC), National Corporation for Information and Documentation (NCID), the General Association of Engineers (GAE), the People's Committee for Economy and Trade (GCET), and the Research Centre for Building Materials and Construction (RCBC), as well as many others. The author also expresses special tanks to Mr Majde Madi and Yousef Saeed of the Research Centre for Building Materials and Construction for their assistance with the empirical study and their help in administering the questionnaires.

Finally, the author owes special a debt to his country Libya for financing his post-graduate education and the costs of the empirical study. Special thanks go to my parents, wife and sons and daughters who missed my care during the duration of the research. Without their patience, support, assistance and encouragement this thesis would never have been completed. Special thanks also go to Mr Len Shaw, whose his valuable comments and suggestions have allowed many language difficulties owing to cultural circumstances to be overcome.

List of abbreviations

The following are the abbreviations which are used in this thesis

CI	Construction Industry
LCI	Libyan construction industry
CBS	Construction and building sector
LCM	Libyan construction market
P1, P2 and P3	The first, second and third construction projects
S.P.L. A.J.	Socialist People's Libyan Arab Jamahiriya (Official Name of Libya)
LD	Libyan dinar
GDP	Gross domestic product
GFCF	Gross fixed capital formation
GPCO	General People's Congress
BPC	Basic People's Committee
LPC	Local People's Congress
GPC	General People's Committee (Council of Ministers)
GCP	General Council for Planning (planning authority)
PCS	General People's Committee of Shabia
GPCSA	General People's Committee for Services Affairs
GPCPBC	General People's Committee for Popular Broad Control
PCET	People's Committee for the Economy and Trade
GAE	General Association of Engineers
GPCI	General People's Committee for Industry
GPCF	General People's Committee for Finance
GCWTO	General Committee for the Workforce, Training and Operation
GPCP	General People's Committee for Planning
RCBC	Research Centre for Building Materials and Construction
LNCSM	Libyan National Centre for Standardization and Metrology
IRC	Industrial Research Centre
GCH	General Corporation for Housing
MP	Ministry of Planning
GPH	General People's Committee for Housing
MH	Ministry of Housing
MHU	Ministry of Housing and Utilities
NCID	National Corporation for Information and Documentation
SU	Secretariat of Utilities
SSA	Secretariat of Services Affairs
CBL	Central Bank of Libya
TCCI	Tripoli Chamber of Commerce and Industry
GMMR	Great Man-Made River
SWOT	Strengths, weaknesses, opportunities and threats

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Chapter One

1 Introduction to the Study

1.1 Background of the Study

The history of the investigation in this study is based on feedback received from the previous experience of the present researcher [1] in working in the construction industry (CI) and its associated processes and operations in Libya over the past twenty-three years. It is argued that while the significance of the CI in any nation's economy and development process has been widely recognized by the research community, and it has received a great deal of interest in most developed and developing countries. However, little attention has been devoted to the CI in Libya. Generally, the industry has been ignored by planners, administrators and economists in spite of its significant contribution to social and economic transformations since political independence at the beginning of the 1950s. Several researchers have indicated that the CI has been neglected by researchers when compared with other sectors such as manufacturing and agriculture (Gorynski, 1978, p.71; Wells, 1986a, p. II; World Bank, 1988, p.25). In addition, existing debates about aspects of current development plans, construction policies, operations and the production processes and practices of the current Libyan construction industry (LCI) do not sufficiently consider Libya's specific geographical, social and economic circumstances.

Therefore, at the early stages of this study, attention was first focused on an investigation of existing strategies and architectural concepts for housing design and construction in the Libyan residential built environment. Therefore, a question was formulated about the association between the CI and urban housing supply, asking to what extent the current practices and operations of the CI influence urban housing supply. The discussion of this question and many others with decision makers, academics, specialists and researchers in Libya during the first field trip in November 2002 (see 5.4.1) showed that the key question for housing and the development process in Libya concerns the state

[1] - The present author has been working as a government employee since 1981, with considerable expertise in design and architectural issues, construction and supervision, housing policies, building materials and development plans. He was the general manager of the General Directorate of the Design of Low Cost Houses Affairs in The Ministry of Housing and Utility between 1991 and 1993, and the general manager of the Research Centre for Building Materials and Construction in Libya between 1998 and 2003. Furthermore, he was a member of the General Council for Planning between 1998 and 2003. During this period, he was a member of several national technical committees concerned with planning, housing, building materials and the construction industry.

of the LCI, and that there are wide gaps in knowledge about the LCI in terms of its development, organization and operations. Thus, it was decided to conduct this study in the hope that this first attempt will bring the attention of researchers, policy and decision makers in Libya to the LCI and its key issues and aspects as well as its role in economic growth and development processes.

1.1.1 The Construction Industry

According to the World Bank (1988, p. 6) the CI is "a sector of the economy which transforms various resources into constructed economic and social infrastructure and facilities. The participants in the construction industry business include the planners, designers, employers, contractors, materials and equipment suppliers, construction workers, financiers, accountants, lawyers, insurers and operators".

Today, there is a consensus among researchers about the importance of the CI in economic growth and development processes. For example, Drewer (1980, p.395) indicated that "the importance of the role of construction in a coherent development strategy is self-evident". Edmonds and Miles (1984, p.2) stated that "the construction industry occupies an important place in any country's economy. It provides an appropriate share of a gross domestic product and generates a high proportion of the gross fixed capital formation" Wells (1986a) confirmed that "the construction activities play a dynamic role in the process of economic growth and development". This issue will be discussed in more detail in chapter two.

The last two decades have witnessed growing concern regarding different issues and aspects of the CI. In developing countries, the industry has received considerable attention from researchers, national governments and international organisations (Edmonds, 1979; Edmonds and Miles, 1984; Ofori, 1980, 1984, 1985, 1991, 2000a; Frenkel et al. 1981; Hebert, 1981; World Bank, 1984, 1988; Wells, 1986; Loraine, 1992; Al-Jarallah, 1983; Djebarni, 1993; Al-Momani, 1996; Mashamba, 1997; Abulfatih, 2000; ILO, 2001; Jie et al. (2001) and many others). However, the CI faces various difficulties and challenges. As a consequence, "the construction industry in most developing countries operates with low productivity and relatively high overall costs, despite low labour costs" (Ofori 1994, p.44).

In Libya, the CI has played a key role in social and economic development processes since the attainment of political independence. As a result, the country has experienced a tremendous increase in the scale and volume of construction activities. For instance, at the end of the 1970s Libya was "the world's leading per capitia consumer of cement" (www.loc.gov, 2004). Furthermore, according to Gijsbers and Lucks (1999, p.385), the world's largest civil engineering project[2] has been planned, designed and constructed in the country since the 1980s to bring water to the people. However, in spite of these huge investments in construction activities over the past four decades, the LCI is an under-researched area.

One can find a considerable number of reports and studies relevant to other economic sectors; however, there is a shortage of data, reports and studies relevant to the CI and its associated activities and operations. For instance, several studies of housing provision have been conducted in the past three decades covering different housing issues and aspects (Doxiadis, 1964; Essayed, 1981; Daza, 1982; Awotona, 1990; Shawesh, 1996; Grifa, 1997; Mukhtar, 1997; Shawesh, 2000; and many others). Only a few studies have investigated specific issues relevant to the CI, such as the labour force in Libya (Ibrahim, 1987; Keibak, 1987; Abbas, 1997). Tarbagaia (1995) studied those factors which influence the success of industrial companies in Libya, but he did not consider companies involved in the CI. Furthermore, the CI is not an attractive topic for Libyan researchers. In a review of dissertations conducted by Libyan Masters and Doctorate students in United Kingdom universities over the past twenty years, it was found that none of them investigated the LCI as a whole or related complementary sectors (www.theses.com, 2004). Furthermore, the planning literature shows that, over the past three decades, the LCI has operated in the context of various social and economic development strategies and various forms of state intervention in the CI (see chapters three and four).

The CI contributed 5.3 per cent of the Libyan Gross Domestic Product (GDP); and it employed around 3.2 per cent of the total workforce in 2003 (General Council for Planning (GCP, 2004, p.11). However, the LCI suffers serious challenges and difficulties. For instance, the capacity of the current LCI is unable to meet national housing supply needs.

[2] - The Great Man-Made River project commenced in 1984, aiming at transferring ground-water from the southern region of the country to coastal cities such as Tripoli, Benghazi, Surt, Tobruk and many others which suffer from drastic shortages in water supplies. The project comprised the construction of a long network of concrete pipes which, when all phases of the project are finished, will reach a total length of around 4000 kilometres. The project was constructed by international enterprises.

Moreover, housing demand in future decades will put even more demand upon the industry (GCP, 2002b, p.29-31). In addition, about 34 per cent of construction projects in Shabiat (municipalities)[3] in the country in 2002 were suspended or stopped altogether (GCP, 2003, p.86). . However, little effort has been made to investigate and understand the industry itself, and to address those key issues and obstacles constraining its processes and operations.

Following on from the above, and given the importance of the CI in both economic growth and development processes, the LCI faces various obstacles and challenges which can be attributed, in general, to factors such as the consequences of rapid social and economic changes, an unstable operating environment, and technical and operational obstacles. However, another important factor is the absence of research into the industry and its associated processes and operations. Thus, the present knowledge of the LCI is poor. Consequently, this study seeks a better understanding of the LCI and its main key characteristics and issues, and of the major obstacles constraining its operations.

1.1.2 Libya: the Context of the Study

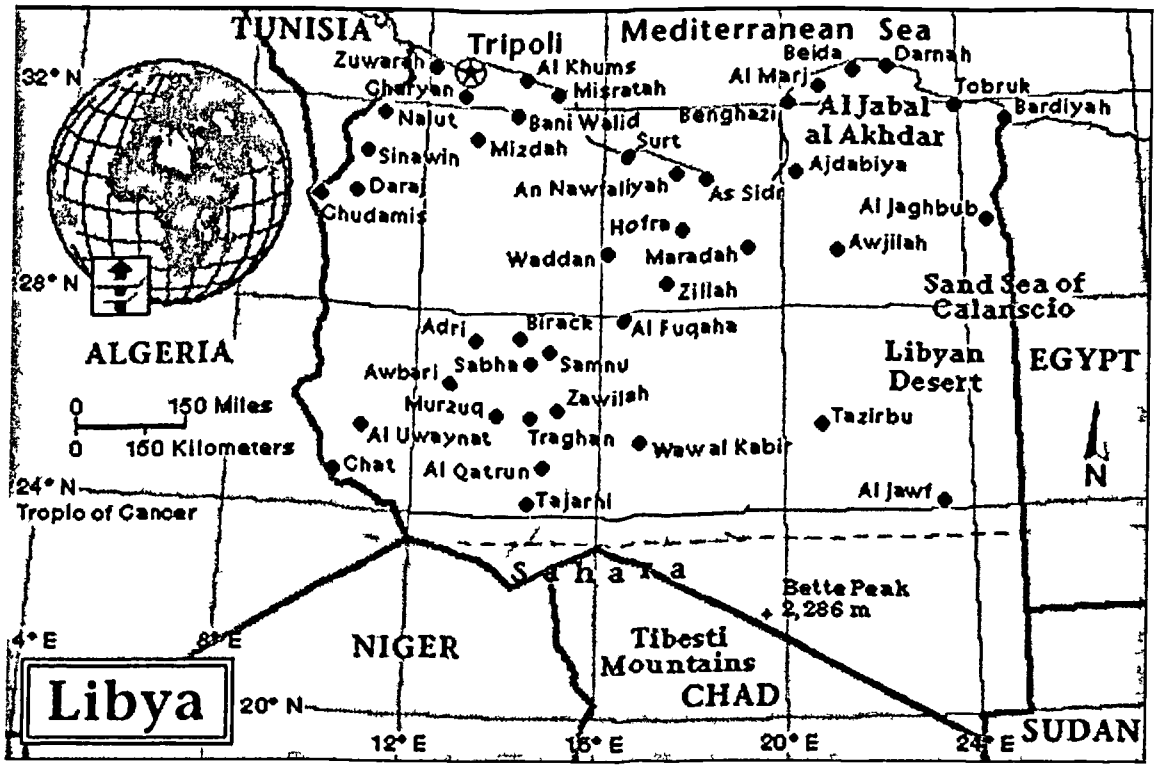
Libya is an Arabic Islamic country situated on the north African coast of the Mediterranean Sea. Until 1942, Libya was an Italian colony, and then the British and French governed it until 1951. The area of the country totals about 1,750,000 square kilometers. The Sahara desert is the main geographical feature of the country. Only around 5-10 per cent of the total land area is suitable for human life and development (World Bank, 1960, p 27). Figure 1-1 shows a map of Libya.

The country comprises four main geographical and planning regions; Tripoli, Benghazi, Sabhah and Al-kalig. It is currently divided into thirty-four Shabiat (municipalities).The Tripoli region is the most important region in the country in terms of social and economic activities. Tripoli city, which is the capital of the country, is in the centre of this region. Generally, Libya is dominated by a dry and hot climate. However, the northern coastal areas are milder and receive a limited rainfall during the winter season between October and March.

[3] - At the time of this study, Libya is divided into 34 municipalities, known locally in Arabic as 'Shabiat' as institutional and administrative units. Each shabia has a local government which is accountable for all construction activities within its administrative boundaries.

The population of Libya was around 5.5 million in 1995 (Ministry of Planning, 1995), and a recent estimate puts it at nearly 6 million (www.nidaly.org, 2004). Economically, Libya ranked 58th out of 162 countries in the UNDP Human Development Report index in 2005 (www.hdr.undp.org, 2005, p.140). The Libyan economy is classified as an oil-based economy. The characteristics of Libya's economy and its influence on the operations of the CI will be discussed in more detail in section 3.6.

Figure 1-1: Map of Libya



Culturally, the people's traditions and values are rooted in the fundamentals of the Islamic religion. The society is organized and structured around the tribe, clan and family (see 3.5.2). The Arabic language is the national and official language; however, English and Italian are used widely, particularly in trade and the construction business.

1.2 Statement of the Problem and Research Questions

According to Moavenenzadeh (1987, p.73), the CI can only play a significant role in economic growth and development processes if it is well understood. Thus, to enable the CI in Libya to fulfil its significant roles, it should be managed efficiently. This requires a better understanding of the LCI and its associated characteristics, processes, operations and obstacles.

As mentioned previously, the LCI and its associated processes and operations appear to be restricted by many obstacles, and its current capacity and capability is unable to meet national construction demand. Consequently, hundreds of construction projects are suspended, delayed or stopped (see chapters three, four and seven). Furthermore, more demand for construction will be put upon the industry in future years (see chapter three and appendix B). In addition, the LCI has a poor image in the construction market owing, in part, to its low performance over the past decades (General People's Committee (GPC), 2000a, p.10).

Therefore, to improve the operations of the LCI, it is necessary to understand what the key factors affecting the CI and its associated processes and operations are, how the industry is organized, how construction activities are conducted, and what the major obstacles constraining the industry's operations are. Thus, this study attempts to answer these questions.

1.2.1 Research Questions

According to Yin (2003, p.7) the research questions posed will guide and determine the research strategy and methodology. Robertson et al. (1996, p.34) defined a robust research question as "the foundation on which you build your study. It helps you decide upon the sort of data you will require, how best to collect that data and the particular focus analysis will take". De Vaus, (1990, p.34) tells us that "the formulation of a research problem is a process involving interaction between the problem and data. The final research problem will evolve in this process as we reflect on and try to make sense of data".

The process of the development of research questions in this study was based on a review of the literature on the CI, the previous experience of the researcher, and early fieldwork trips to the place of the study. In addition, the questions were also improved by discussions with specialists, and were finally revised and amended throughout all the phases of the research process in order to meet the purposes of the study. At the end of this process, the study attempts to answer the following key questions:

1. What is the current status of the CI in Libya?
2. What factors have shaped (and are shaping) the LCI?
3. How will its current status influence the future operations of the CI in Libya?

The above central questions can be broken down into a set of sub-questions as follows:

1. How is the LCI organized?
2. How does the industry operate?
3. What are the key issues, strengths and weaknesses of, and opportunities for and threats to, the LCI?
4. Why is the LCI as it is now?
5. To what extent do external and internal factors influence the operations of the LCI?
6. What are the major obstacles constraining its current operations?
7. What are the impacts of its current status and operations on society, the economy and the environment?
8. Do the current status and operations of the LCI have the ability to respond to future changes and challenges?

1.2.2 Research Aims and Objectives

The broad aim of this study is to explore, describe and understand the LCI and to identify major obstacles constraining its operations. Particular attention is given to its development, general characteristics and operations. To achieve this aim, the research processes have been guided by the following objectives:

1. To investigate the nature and characteristics of the LCI.
2. To explore the external and internal factors that have affected (and which are affecting) the operations of the LCI.
3. To explore the current practices of the industry and its future operations.
4. To identify and examine the major obstacles constraining the operations of the LCI.
5. To draw out key findings and conclusions concerning the LCI.
6. To suggest recommendations, implications and future research.

1.2.3 Research Strategy

According to Sharp et al. (2002, p.14), research can be conducted by one or a combination of research approaches: laboratory experiments, field experiments, case studies and surveys. Yin (2003, p.5) stated that there are five major research strategies: experiments, surveys, archival analysis, histories and case studies. He indicated also that the employment of a particular research strategy is dependent on the type of research itself and its questions, the extent of control the investigator has over the actual behavioural

events, and the degree to which the focus is on contemporary circumstances as opposed to historical events. He concludes, that 'what' questions can be answered by exploratory survey research and archival analysis, while 'why' and 'how' questions can be investigated by case studies, experiments and historical research.

Since the early stages of this study, it was apparent that the first and most important point to consider was: what was the best location and context in which to research the LCI, which has not been studied before. One outcome of the literature review was that it was essential to carry out a primary survey of the context of the study in Libya. Therefore, the first fieldwork trip to Libya was made in November 2002; the main purpose was to hold discussions with specialists, professionals and key actors involved in the operations of the CI. The feedback received revealed that, owing to a lack of previous studies and data, the best strategy to approach the LCI would be to investigate the real life practices and operations of the industry. Thus, the research strategy of this study was based on observations of the current state of the LCI. In this sense, the study is an exploratory investigation which was based on survey research.

As mentioned in section 1.2.1, there are three central questions in this study; of which one is in the 'how' form, while the other two are in the 'what' form. Therefore, according to the outcome of the literature review, the feedback received from the first trip to Libya and Yin's (2003) views, it was clear that the survey approach was appropriate for investigating the LCI. This approach has been used as a research strategy in the CI by many researchers (Ofori, 1980; Melo et al, 1994; Micelli, 2000; Eyiah et al., 2003; Milnga et al. 2002; and many others). Table 1.1 lists the different research strategies and their relationship to the research questions.

The choice of the survey can be explained by the following reasons. Firstly, survey research meets the purposes of the study because it provides a good opportunity to choose a real construction context in which the research questions can be investigated. Secondly, as mentioned in section 1.1.2, Libya is a large country in terms of area and major settlements and cities are separated by wide desert and semi-desert areas and long distances. This is one of the major limitations which persuaded the researcher to focus the study on a single city. In this regard, Ofori (1989, p.112) suggested that a "geographical categorization might be useful in the study of the construction industries of large

countries". Thus, it was clear that survey research was an appropriate research approach for investigating the LCI.

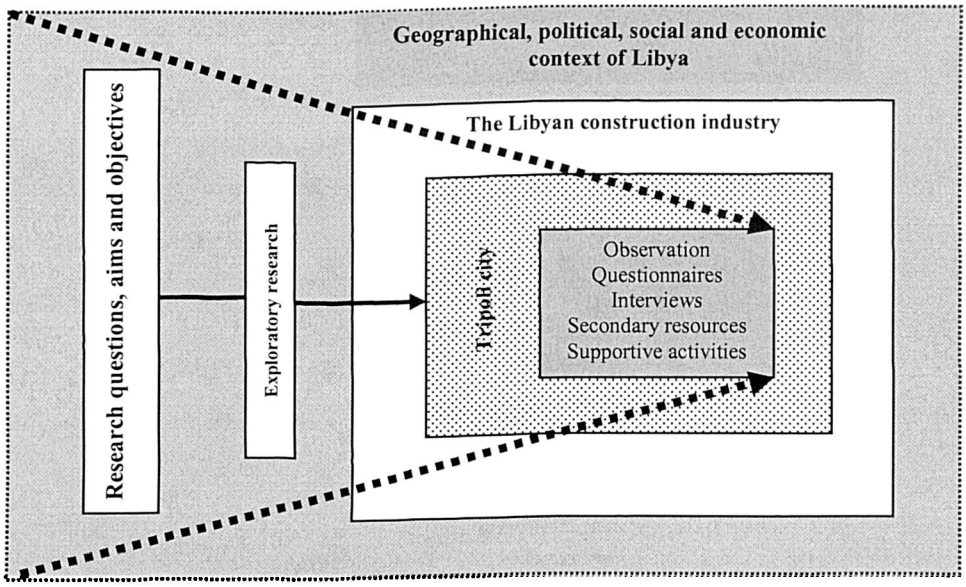
Table 1-1 : Research strategies and their relationships to the research questions

Strategy	Form of research questions	Requires control of Behavioural events	Focuses on contemporary events
Experiment	How, why?	Yes	Yes
Survey	Who, what, where How many/much	No	Yes
Archival analysis	Why, what, where How many/much	No	Yes
History	How, why?	No	No
Case study	How why?	No	Yes

Source: COSMOS Corporation; quoted in (Yin, 2003 p.5), and modified by the author.

Therefore, it was decided that the survey would be conducted in Tripoli city, which was seen as an appropriate context for investigating the LCI (see 5.4.3). Figure 1.2 explains graphically the design of the research.

Figure 1-2: Research strategy of the study and its main components



The choice was based on the following points. Firstly, the vast majority of key decision makers, actors (clients, consultants and contractors), consultancy and construction firms, suppliers, government departments and others involved in the CI are concentrated in the Tripoli region in general and in Tripoli city in particular. Secondly, the city is rich in terms of history, cases, data and information concerning the LCI; and thirdly, owing to the

current researcher's previous work and experience, the accessibility and collection of data was possible.

The data and information were collected by a review and analysis of secondary resources and data relevant to the CI, observations, questionnaires, formal and informal interviews and other supportive research activities (see 5.4 and 5.5). The reason for adopting these methods is discussed in more detail in chapter five. To ensure that the evidence and findings emerging from the Tripoli city were valid, the theoretical framework of the study guided the discussion, analysis and interpretation of the findings (see appendix C: data analysis strategy). Furthermore, in order to generalize the findings of the study, the relationship between the operations of the LCI in Tripoli city and the local CI in other regions was considered (see 9.12).

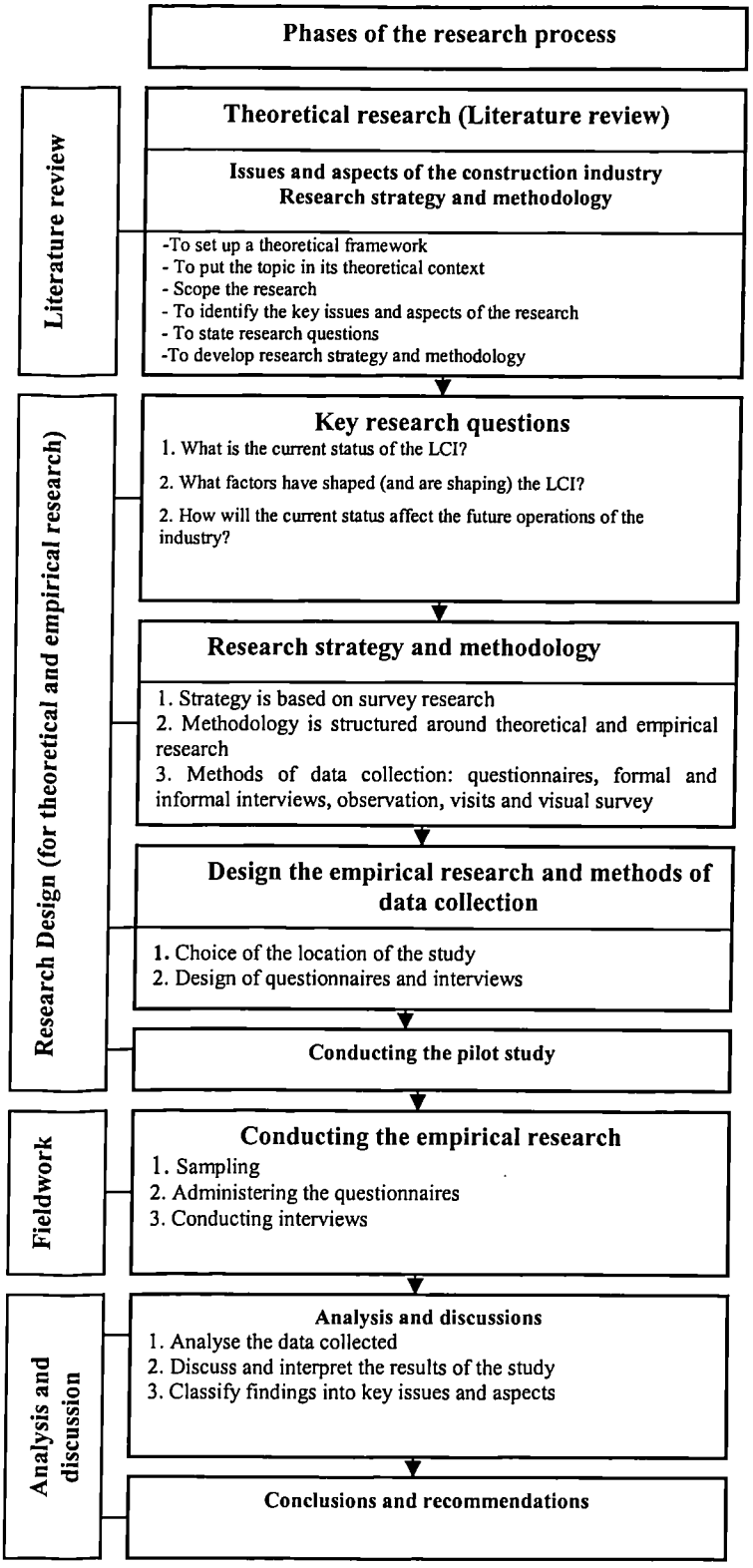
From the above, it can be said that the research strategy of this study consisted of an exploratory investigation organized around survey research. It is exploratory because its main purpose is to discover and understand a new area, which is in this context the LCI. In addition, it is descriptive because it describes the key characteristics of actors, firms, projects, construction processes and operations in the industry. This type of research usually raises issues for further research. Furthermore, 'why' questions give the study an analytical dimension in which research variables and relationships between key issues are explored and examined.

1.2.4 Research Process

Figure 1-3 presents diagrammatically the research process of this study. The whole research process comprised five continuous and dynamic major phases as follows:

1. At the outset of the research, a review of literature was made. The review focused on the CI and its relevant issues. Also, the place of the study and the development of the LCI were explored and reviewed. In addition, the literature on research strategy and methodological issues and techniques of collecting data was also scrutinised. Chapters two, three and four review and explore the above issues.
2. The second phase of the research process was based on the outcome of the first phase. The research methodology, methods of data collection, and the empirical research were developed and designed. In addition, the location was chosen, and the pilot study was conducted. Chapter five discusses this phase in more detail.

Figure 1-3: Phases of the research procedure



3. The third phase included conducting fieldwork, in which questionnaires and interviews were conducted. In addition, some construction firms, producers and suppliers of

construction materials and construction projects were visited. Furthermore, many supporting research activities were undertaken, such as a visual survey and informal interviews. Chapter five explains this phase in detail.

4. The fourth step was to prepare the data for analysis. This included classifying the data collected and selecting the appropriate techniques for analysis. Also, it comprised of processing, interpreting and elaborating data through the use of selected tools. Then, the results of the research were categorized into key issues and aspects (see appendix: C). Finally, this phase included the presentation, discussion, analysis and interpretation of the results of the study. Chapters six, seven and eight are devoted to this.

5. The final phase included summarizing and bringing together the theoretical and empirical findings and drawing conclusions. Also, recommendations and suggestions for further research were outlined. In addition, it explained the implications of the results of the study in Libya's context and for other similar countries. This phase ended by recording the research limitations and challenges. Chapter nine is devoted to these issues.

1.3 Scope, Limitations and the Organization of the Study

As mentioned previously, the general purpose of this study is to explore and understand the main characteristics of the LCI and its associated processes and operations, as well as to identify those major obstacles constraining its practice and operations. However, the main scope of this study does not include the informal sector. According to Ofori (1989, p.115), the operations of the formal sector are organized and guided by building, planning and construction regulations and permissions from design to commission, while the informal sector operates without such complete consideration for regulations, standards and permissions (see 2.3.4).

Thus, the study is limited to the formal LCI in Tripoli city, owing to geographical, technical, time and financial limitations, as well as the absence of relevant data. The term 'Tripoli city' in this study refers to the Tripoli Shabia (Muinciplity). The reasons underlying the choice of Tripoli as the context of the study are discussed in more detail in section 5.4.3. Moreover, owing to time limitations, the influence of construction technology on the industry's operations is beyond the main scope of this study. Since the area of this study has been under-researched in the past, it was expected that various limitations and problems would be faced. In general, the limitations of the research are summarized in sections 5.9 and 9.11.

1.3.1 Significance of the Study

Given the absence of any prior major studies of the LCI, the major significance of this study is that the LCI is now better investigated, understood and documented. This will help policymakers and decision makers and others concerned with the CI and its processes and operations in Libya to gain a fuller understanding of the industry, enabling them to make efficient decisions to formulate short and long-term construction strategies and policies to improve the industry's processes and operations. Also, there are three other key reasons which make this study significant:

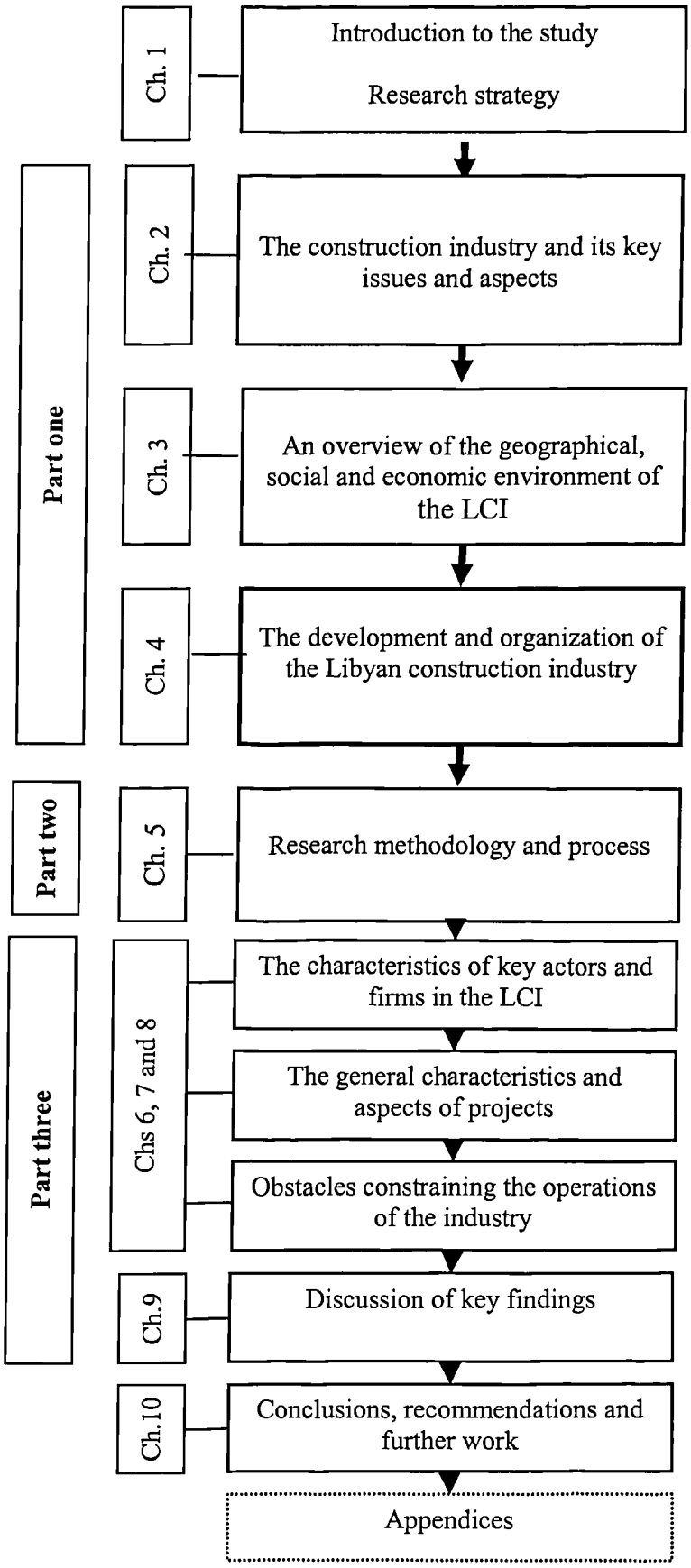
1. The study fills a gap in knowledge in the literature relevant to the LCI, and introduces and documents the LCI for the research field of the CI in general and in developing countries.
2. The study assists government departments and decision makers to be aware of the significance of the CI in economic growth and the development process.
3. The study can be considered as a milestone and a significant reference for future research in particular. The value of this research is highlighted in section 9.13.

1.4 The Organization of the Thesis

The thesis comprises three main parts; the first part is devoted to reviewing and exploring the CI and its key issues, and to building up the theoretical framework for the study. Also, the geographical, political, social and economic circumstances of the place of the study, and the development and current status of the LCI are reviewed and discussed. The second part introduces the research methodology and processes, and part three analyses the empirical data, and discusses and interprets the study's findings. In addition to these three main parts, chapter one introduces the study, chapter nine draws conclusions and outlines the recommendations of the study.

Furthermore, five appendices include the questionnaire and interviews, the construction industry and housing supply in Libya, the data analysis strategy and the categorization of the findings, the laws and regulations relevant to the LCI and its associated processes and operations and a sample of interviews transcriptions, ANOVA test, the visual survey and observation (see appendices A, B, C, D and E). A short summary is provided below of the chapters of the thesis. Figure 1.4 explains graphically the outline of the study.

Figure 1-4: The organization of the study



Chapter one: This chapter is devoted to introducing and justifying the study. Close attention is given to the research strategy adopted to investigate the LCI.

Chapter two: This chapter reviews the CI and its key issues and aspects. The main objectives of the chapter were to put the topic in its theoretical context, to enable the researcher to identify the key variables of the research, and to develop the methodological framework and the design of the empirical study.

Chapter three: This chapter explores and reviews the geographical, political, social and economic context of the study, and addresses key issues relevant to the distribution, organization and operations of the LCI.

Chapter four: The development and organizational and technical changes in the LCI in terms of resources, construction processes, operations and technology and its current status are explored, reviewed and documented in this chapter.

Chapter five: This chapter introduces the research methodology employed in this study, and reports on the procedures and operations used in the empirical research. This chapter is underpinned by appendix C, which describes in detail the strategy used for the analysis of the data collected during the empirical research and the process of categorization of the emergent key findings.

Chapter six: This chapter reports on the empirical findings of the study relevant to the characteristics of the key actors and the features and resources of the firms in LCI.

Chapter seven: This chapter provides the findings of the study relevant to construction projects in the LCI and their associated procurement systems and obstacles.

Chapter eight: This chapter identifies the major obstacles constraining the operations of the LCI, and the perceptions of the key actors of the LCI.

Chapter nine: This chapter summarises, combines and discusses the key theoretical and empirical findings of this study.

Chapter ten: The last chapter of the thesis draws key conclusions and makes recommendations concerning the implications of the study's findings and further research. The chapter also reports the major limitations of the research.

Chapter Two

2 The Construction Industry

The general aim of this chapter is to build up the theoretical framework of the study, and to put the topic in its research context. In addition, it enables the place of the study and the current status of the Libyan construction industry (LCI) to be explored and reviewed. Furthermore, the research strategy and methodology can then be designed and developed, and the empirical research planned, designed, and conducted. The chapter thus paves the way for the discussion and analysis in all of the subsequent chapters. To achieve this aim, the chapter reviews the construction industry (CI) and discusses its key issues and aspects.

The chapter is divided into ten sections. The first deals with the CI; the second section highlights the importance of the CI in the economy and development processes; and the third section sheds light on the structure of the CI. The fourth section discusses construction demand and supply; and the fifth outlines the characteristics of construction projects. Section six explores firms and their roles in the CI, the seventh section reviews construction resources, and section eight discusses construction processes and procurement systems. Section nine identifies general major barriers constraining the operations of the CI, particularly in developing countries, and the final section proposes a model for the CI. The chapter ends with a general summary and conclusions.

2.1 The Construction Industry

The French say that, "when construction is going well, everything is going well" (CCFGB, 1993, p.3). The first point to consider in this study is what is meant by the term 'the construction industry'. According to the Oxford English Dictionary (2004), the term construction is "the action or process of constructing or the industry of erecting buildings" (http://www.oxfordreference.com, 2004). The International Standard Industrial Classification of all economic activities (ISIC), Version 3.1 (ISIC, 2004, Rev 3.1), defines the term construction as: "General construction and special trade construction for buildings and civil engineering, building installation and building completion. It includes new work, repair, additions and alterations, the erection of prefabricated buildings or structures on the site and also construction of a temporary nature". Murdoch et al. (1996, p.1) indicated that

construction is relevant to the erection, repair and demolition of elements of our physical built environment. To Ive et al. (2000, p. 5), "construction is a certain kind of production of a certain kind of object with a certain kind of use". These definitions explain that construction is the processes and operations which are responsible for producing and maintaining our physical built environment.

According to the World Encyclopedia (2005), the term' industry' is "all businesses that produce goods or services. The term is also used to define a group of firms producing a similar kind of product, such as the computer industry. Industries are often classified into three groups: *manufacturing* industries process commodities; *agriculture* provides food; and *service* industries provide largely intangible services, such as entertainment". In the words of Gruneberg et al. (2000, p.90) an industry is "a set of firms using the same specific types of resources of labour, equipment and technology. The supply side of a market is then a set of firms producing a product". Thus, it can be said the industry is the way in which business and resources are organized.

The review of literature shows that the CI can be defined from different points of view. In what follows, a brief outline will be introduced of some key important concepts. In the first meeting of the International Council for Building Research and Innovation in 1999, the CIB (Task Group) TG29 on construction in developing countries, the CI is defined as:

> "All those organisations and persons concerned with the process by which the building and civil engineering works are procured, produced, altered, repaired, maintained and demolished. This includes companies, firms and individuals working as consultants, main and subcontractors, materials and component producers, equipment suppliers, builder and merchants. The industry has a close relationship with clients and financers".

Ofori (1980, p.70) argued that the CI:

> "Is responsible for the planning, design, construction, maintenance and eventual demolition of the buildings and works which enable economic and social activities to be performed. It is essentially several industries attaining its inputs from various sectors of the economy with which it is interrelated and interlinked in a complex manner".

From the above statements, it can be said that the CI is a broad organization which transfers construction resources into the physical built environment. It involves all those parties involved in construction management, production and operational processes. However, it should be noted that the above definitions do not refer to the geographical and climatic environment where the industry operates.

The CI is seen as a cluster of industries. For instance, Drewer (1978 p.50) argued that "Construction is not one industry but a collection of industries". Furthermore, he suggested that the CI must be viewed as the end output of a variety of industries, rather than one industry (Drewer, 1980, p.404). Also, Turin (1980b, p.271) stated that the CI consists of:

> "The industries producing raw and manufacturing building materials and components.....[including] the professionals involved in designing, supervision, assessing, and controlling the building process. Some even involved the client and the user in the definition of construction".

In the above views, the CI is seen as a group of industries operating in the construction field. In practice, this concept requires an efficient operating environment and communication systems and channels

There is a view which argues that the CI is a set of sequential operations which are organized around a construction project. In this regard, Wells (1986a, p.2) argued that the CI is a set of activities which are organized around construction projects. Many actors and participants generate and operate these activities. Groak (1994, p. 290) also saw the CI as construction activities that "are determined significantly by the project, not by the firm". Bon et al. (2000, p.13) described the industry as a set of sequential activities including the assembly of building materials and/or components on site in accordance with plans, designs and management. These activities are conducted by the manufacturing, supply, transportation and trade sectors, and their funds are supplied by the financial service sector. According to this view, the CI is seen as a set of processes and operations which transforms construction inputs (materials and information) into completed or partially completed products (Serpell and Alarcon, 1998, p.216). In the light of these definitions, the CI is seen as a set of sequential operations which are organized around a construction project, and which are conducted by many actors and operatives.

From the economic perspective, Moavenenzadeh (1978, p.98) saw the CI as that "sector of economy which, through planning, design, construction, maintenance and repair and operation, transfers various resources into constructed facilities". In this regard, Chen (1997, p.1) argued that without construction no economic activities would exist. This view focuses on the economic dimension of the CI and its associated activities. The majority of studies of the CI are based on this perspective. This is mainly because economic issues are

of significance throughout all of the processes and operations of the CI in terms of finance, cost and profit.

Furthermore, the last decade has experienced the emergence of new approaches to and definitions of the CI, the most important of which are partnering in construction. These will be discussed in detail in section 2.3.3. However, in practice it can be argued that "it is not possible to define the CI to make it synonymous with the execution of all construction activity" (Ive et al., (2000, p. 7). This may be because of its broad scope and the dynamic nature of its processes and operations.

Since this study seeks to explore, describe and understand the LCI and its operations, therefore, it can be said that, in this study, the initial operational definition of the CI is the processes and operations of transforming construction resources (land, capital, labour, materials and knowledge) into the physical built environment in a certain geographical, political, social and economic environment. These processes are affected by the way in which construction business is organized, and the systems and regulations by which construction activities are conducted. Added to this, the characteristics of the key actors and other participants, the nature of construction resources, the features and resources of firms, the characteristics of construction projects and the ways in which the industry, firms and projects are organized and operated are also crucial.

2.1.1 Characteristics of the Construction Industry

According to Moavenenzadeh (1978, p.98), the products of the industry have unique characteristics, "including their custom-built nature, immobility, high initial expense, complexity, and continuously changing technology, [which] set construction apart from many other industries in both developing and developed countries. Most construction activity is initiated by sources outside the industry itself, which enters the picture to begin production only after the customer has determined his need for a facility and has decided to procure it". Based on the review of literature, the seven most unique characteristics of the CI are summarized as follows:

1. The industry has a complex structure and long construction processes, where most of its operations are conducted in open sites where weather circumstances affect its productivity and performance (Hillebrandt (1984, p.7).

2. Traditionally, the industry's activities require a large number of qualified, semi-skilled and skilled workers, and it is a labour-intensive industry (Edmonds and Miles, 1984, p. 11; Ball, 1988, p.89).
3. The industry is organized around a construction project (a project-based industry) as mentioned in section 2.5.
4. The industry is a dynamic process in terms of procedures and technology, and its products vary in terms of size, value, type of inputs, location, processes and cost (Drewer 2001, p. 71).
5. The construction industry is a high risk business (Cook, 1991, p.6). "Construction is, and will continue to be, a high risk industry in developing countries" (Wells, 1985, p.337).
6. The industry's design and construction processes are usually separated. Furthermore, the uncertainty and irregularity in the supply of materials, labour, and equipment, and the instability of economic conditions during the construction processes, are the main characteristics of the CI's environment. Added to this, it relies heavily on casual or informal workers (Harvey et al., 1993, p.2; Kwakye, 1997, p 6-7; and Djebarni, 1993, p 1).
7. The CI is a domestic and contextual industry in most countries (Agapiou et al. 1995, p.149; Loosemore et al. 2003, p. 137).

2.1.2 Characteristics of Construction Products

The final products of the CI form our physical built environment (buildings and infrastructure works). Buildings are the overwhelming majority of construction products (World Bank, 1984, p.4). Wells (1986a) indicated that, in most developing countries, nearly a half of total construction products are infrastructure projects. According to Ive et al., (2000, p.4), the construction products of the built environment include "any and all of the activities which contribute to the creation of a certain kind of object, namely buildings and other fixed structures".

Wells (1986b) and Hillebrandt (2000, p. 31) argued that products of the CI vary in terms of size, appearance, location, cost, lifespan and also their end use. In addition, the features of the products are determined by the geographical and socio-economic context (land topography and climatic circumstances, political, social and economic conditions), the nature of construction input (labour skills, nature of materials, capital), and type of construction technology (nature of operations and production processes, equipment and tools). Added to this, culture and construction traditions are important factors. In addition,

construction products are seen as an indication of social and economic circumstances, as explained in chapter three. Others see them as an indicator of the productivity, degree of knowledge and skills of a particular society (Ive et al, 2000, p.13).

In short, the form and shape of our physical built environment is produced by the CI. These products range from residential and non-residential buildings to sophisticated infrastructure works. However, it is argued that production and operations processes associated with products should be planned to be integrated into geographical, climatic, social, economic and technical circumstances.

2.2 The Importance of the Construction Industry

The importance of the construction industry (CI) in economic growth and development process has been widely identified and documented. Nowadays, there is a consensus among researchers about the vital role of the industry (Strassmann, 1970; Sugden; 1975; Selassie, 1978; Turin, 1978, 1980a, 1980b; Ganesan, 1978; Gorynski, 1978; Moavenzadeh, 1987; Hillebrandt, 1984, 1988, 1989, 1999; 2000; Ofori, 1980, 1984, 2000; Cook, 1991; World Bank, 1984, 1988; Wells, 1984, 1986a; Drewer, 1978; Lopes et al., 2002; Bennett, 2003; and many others).

For example, according to Turin (1978, p.41), Moavenzadeh (1987, p.79) and the World Bank (1984, p.41), around 3-9 per cent of GDP in developing countries and between 45 and 80 per cent of GDCF is provided by the CI. Furthermore, Ofori (2000) argued that the CI in developing countries has a significant role to play in disaster periods. He pointed out that it is necessary to enable the industry to be capable of efficiently responding to disasters by saving and protecting lives, reconstructing infrastructure, and reinstating economic activities.

Furthermore, the CI makes a significant contribution to employment. Moavenzadeh (1978, p.100), Wells (1985, p. 335), Hillebrandt (1999, p. 26) and many others have argued that the CI employs a wide range of employees. Moreover, the industry is easy to enter, and it is very simple to start-up a business in construction without requiring high levels of capital. Added to this, for example in Kenya, China, India, Egypt, Brazil and many other developing countries, the industry has an important role in employing the uneducated (ILO, 2001, p. 14-15). Furthermore, the employment process in the CI creates social and cultural relationships between individuals and nations. For example, one of the main characteristics

of the Egyptian construction market is that subcontractors and craftsmen meet in coffee houses to socialize with each other, negotiate about work and contracts and discuss workers' circumstances (ILO, 2001, p.16). Therefore, it can be said that the employment process in the CI enhances social and cultural relationships between members of local communities and international society. However, employment in the CI is subject to fluctuation over time.

The contribution of the CI to development processes is well defined and documented (Ofori, 1980; World Bank, 1988, p.7; Moavenzadeh, 1987, p.73-74; and many others). For instance, Ofori (1990) stated that that there is a strong linkage between the CI and the development process, it has direct and indirect contributions and backward linkages. The direct contribution appears as a physical output, while the indirect contributions include wide opportunities for employment, growth and prosperity in other economic sectors such as the manufacturing, processing and agricultural industries, and the financial, communications and transportation services. Backward linkages appear when the industry's products are utilized in other production activities and services.

The literature on development issues shows that, in most developing countries, the CI will play a central role in the coming decades. This is possibly because the major challenges facing those countries are strongly related to the CI and its activities. In this regard, Tiwari (2001, p.246) indicated that, at the beginning of the 21st century, providing adequate shelter, employment and a sustainable environment are the three most serious challenges facing developing countries. Consequently, intensive demand will be put upon the CI in most developing countries, and the industry has an important role to play in development processes.

To make the above figures and discussion more concrete, it is useful to refer to the place of the CI in the economies of particular countries. For example, in the United Kingdom in 2002, the CI accounted for one tenth of the Gross Domestic Product (GDP), and about 1.4 million people were employed in it (DTI, 2004). According to Chen et al. (1997, p.10), since China reformed its economy in 1980, the CI has contributed significantly to economic growth because its output increased and its share in the GDP jumped from 3.6 per cent in 1978 to 6.7 per cent in 1998, before declining slightly to 6.6 per cent in 1999.

In Arabic countries, Jannadi and Bu-Khamsin (2002, p.539) indicated that around 44 per cent of Saudi Arabia government expenditure between 1970 and 1985 was devoted to construction investments. In 2000, around 15 per cent of GDP (non-oil economic activities) was produced by the CI. In addition, it employed around 9 per cent of the total workforce. However, the majority were foreign workers, and Saudi employees were concentrated in professional jobs (Saudi Arabian Information Resource, 2000). Three points can be made from the Saudi case. Firstly, it is a good example of the role of the CI in an oil-based economy; secondly, the performance of the CI is associated with oil revenues; and thirdly, the operations of the industry rely heavily on foreign workers.

In Jordan, in 1998, 5.8 per cent of the national GDP was produced by the construction sector, and 6.4 per cent of the total workforce was employed in this sector. Also, 42 per cent of public bids were in construction investment (Ministry of Planning in Jordan, 1998). The case of the Jordanian CI is a good example of the contribution of the industry in a small country in terms of population (around 5 million). In Kuwait in 2001, the CI contributed only 2.4 per cent to GDP, and only 2.2 per cent of the total workforce was employed in it, with only 0.75 per cent being Kuwaiti workers (Ministry of Housing in Kuwait, 2004). In Libya in 2003, the CI contributed around 5.3 per cent of GDP and around 3.2 per cent of the total workforce was employed in it (see 1.1.1). The low percentages of the employment in the CI of nationals in Saudi Arabia, Kuwait and Libya can be attributed to the influence of the oil economy.

From the above, there is a robust consensus among researchers that the CI has a dynamic role in economic growth, employment and development processes. However, it can be argued that unplanned construction activities can restrict these economic processes. For example, in many countries, the operations of the CI depend heavily on a pool of skilled and semi-skilled foreign workers, and its production processes are based on imported construction inputs, technology and equipment. Furthermore, the final products are not efficiently integrated into their context in terms of planning, design, production and operations. Also, repair and maintenance work may require imported skilled labour, materials and components. In such industries it is argued that, in the long-term, the CI can restrict economic growth and development. As Drewer (1980 p.406) suggested, "construction for construction's sake is likely to cause more problems than it solves".

2.3 Structure of the Construction Industry

According to the World Bank (1984, p.29), Hillebrandt (1984, P.2-3) and Wells (2001, p.269), the structure of the CI is affected by several main factors: the nature of work to be constructed, the selection of technology, and the country's social, political and economic circumstances, as well as tradition and attitudes towards construction business, the characteristics of the operating environment and the type and structure of construction demand.

According to Ofori (1991, p.19), in most countries the structure of the CI is characterized by a pyramid in which the industry consists of a majority of small firms and a few large companies. Sebestyen (1998, p.43) indicates that the structure of the CI affects its operations and its overall performance. Furthermore, the structure of the CI is subject to change over time owing to changes in the CI itself in terms of size, organization and the characteristics of products and its operating environment. However, changes generally occur smoothly and slowly. For example, Hillebrandt and Cannon (1990, p.3) noted that, in spite of the enormous changes which have influenced the UK construction industry over the past two decades, the structure of the industry still comprises of a small number of large firms and an enormous number of small firms.

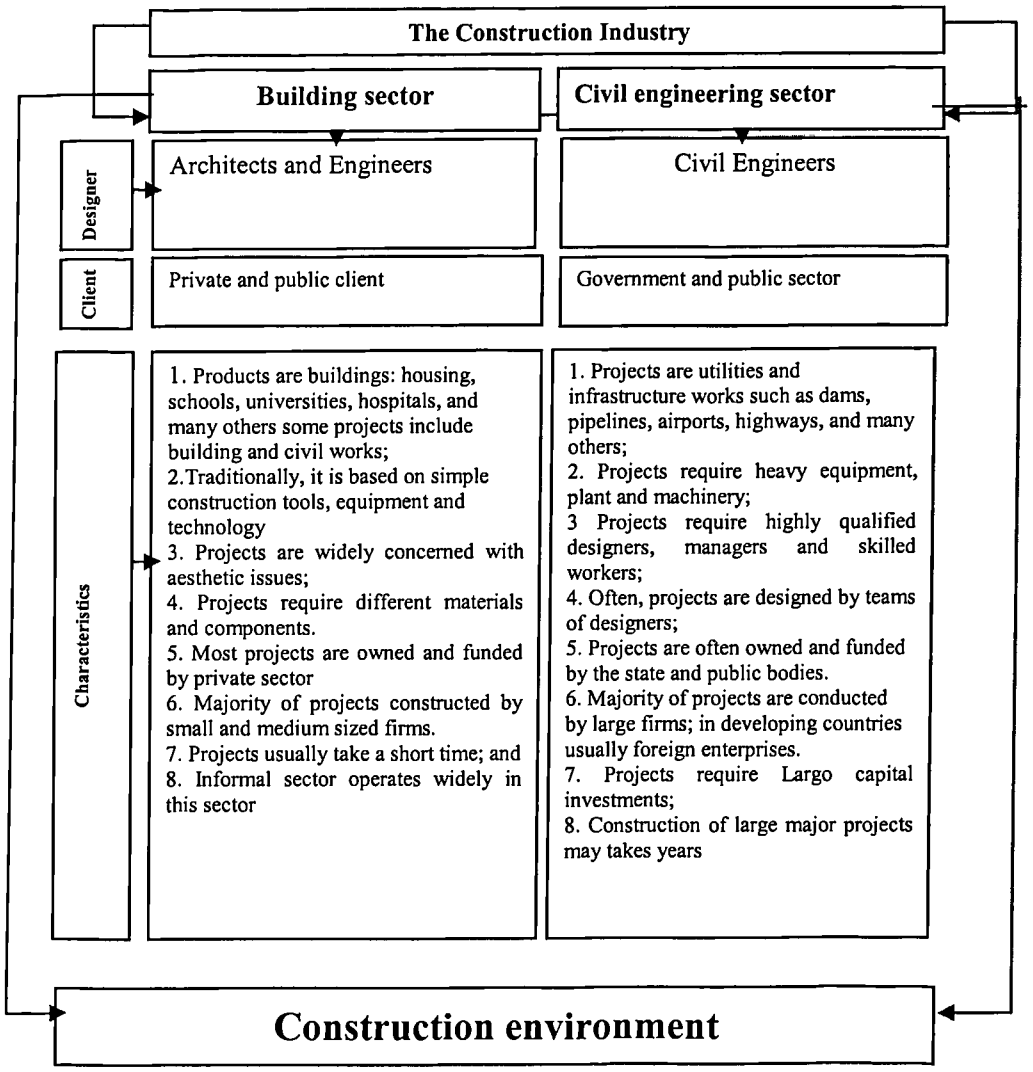
Traditionally, the CI in most countries is classified into building and construction sectors. However, partnering in construction has been introduced as a new approach to organizing the CI and its associated processes and operations in some developed countries (see 2.3.3).

2.3.1 Building Sectors

According to the International Standard Industrial Classifications (ISIC, Rev 3.1 code 4520), construction is classified into two activities: the construction of all types of buildings and the construction of civil engineering projects (ISIC, 2004). Table 2.1 shows a classification and characteristics of the construction industry into building and civil engineering.

Generally, the building sector is dominated by small and medium sized firms. A significant proportion of construction activities, particularly in the housing sector and for small buildings, are conducted by the informal construction sector (see 2.3.4).

Table 2-1: Structure of the construction industry



Source: compiled from the World Bank (1984, 1988), Hillebrandt (1984), Ofori (1980), Wells (1986), Bennett (2003).

2.3.2 Civil Engineering Sector

In general, civil engineering projects require large amounts of capital, highly qualified and skilled workforces and heavy machinery and equipment (see table 2.1). Therefore, large and specialist firms usually monopolize construction work in this sector, and the government and its related departments and public bodies are the major clients of the projects of this sector. This gives the government the ability and power to control construction demand and the market. In practice, it is difficult to separate the building and civil industry. There is usually an overlap between the two. Turin (1980a, p.271) argued

that in the United Kingdom's construction industry, the dividing line between building and construction or civil engineering is not clear; and both terms may be used in different ways.

2.3.3 Partnering in Construction

Recently, many researchers have highlighted the importance of partnering in construction, such as Shek-Pui Wong (2004), Naoum (2003), Black et al. (2000), Beach et al. (2005) and many others. The literature on the CI shows that partnering has developed in Japan, the USA, and Australia and recently in the UK construction industry as well as other countries. On Cheung et al (2003, p. 333) argued that "partnering is not easy to define". This is mainly because it is based on philosophy, beliefs and commitments.

However, Bennett (2000, p. 50) sees partnering or cooperation in construction as "people working together on the basis of common interests". Black et al. (2000, p.423) pointed out that partnering has been increasingly used in construction projects in which partners conduct a project together in an environment of trust and openness with the aim to complete the project efficiently and without difficulties. Bayliss et al (2004, p. 253) stated that "the use of a partnering approach to deliver construction projects seeks to avoid the confrontational setting where energy is used in a non-productive manner". Therefore, the main objective of partnering is to improve integration, encourage cooperation between project teams and enhance project performance. For instance, according to Naoum (2003, p. 71), partnering in the UK construction industry improves "productivity, lowers costs and provides products of construction to satisfactory standards and time". However, the success of partnering in any construction project depends on trust between partners and efficient management (Shek-Pui Wong et al. (2004, p.438).

In short, it is clear that partnering in construction is a procurement approach in which the partners of a construction project are integrated and cooperate in order to produce the project within its standards, cost and time. However, a stable operating environment, and trust and openness between partners are the key factors which determine the success of partnering in construction.

2.3.4 Formal and Informal Construction Industry

According to Jhabrvarla et al (2003, p.2), today "worldwide there is a growth in the number of people working in the informal economy: either as self-employed in unregistered enterprises or as waged workers in unprotected jobs". Auriol et al. (2005, p.

625) argued that 'informal sectors are larger in developing countries than in rich countries". Nowadays, it is also widely recognized that, in the CI, the informal construction sector has an important role in supplying construction materials, labour, services and products. However, in practice, the boundaries between the operations of the formal and informal construction sectors are not clear. There are usually overlaps between the operations of both sectors.

Moavenzadeh (1987, p.75) argued that the CI in developing countries is divided into the formal sector, which is mainly dominated by licensed firms, and the informal sector. Mlinga and Wells (2002, p. 269) confirmed the above and indicated that "the construction industry in developing countries comprises a regulated formal part and unregulated informal part". In addition, in the first meeting of the CIB Task Group 29, the informal construction sector was defined as "unregistered and unprotected individuals and small enterprises that supply labour and contribute in various other ways to the output of the construction sector" (CIB, 1999). The World Bank (1984 p.30-31) indicated that the informal sector is operated by individual jobbers and workers, self-employed builders, and family and small firms, and that the sector dominates small construction works in most developing countries. However, Mlinga and Lema (2000) suggested that over time there are many informal contractors which join the formal construction sector, and vice versa. It is clear that regulations are the main difference between the operations of the two sectors. However, in practice, many professionals and experts work without licenses and registrations.

The informal sector is considered of significance in the different operations of the CI. For example, Ridel et al. (1978, p.230), and Moavenzadeh (1987, p.78) pointed out that the number of houses built by the informal sector in developing countries was about four times those accounted for in formal statistics. This is mainly because in most developing countries self–help construction is the only easy way for poor households to become house owners (Gough, 1996 p. 651). Furthermore, Sivam (2002, p.523) indicated that the informal land market is much bigger than the formal market in most cities in developing countries. Mitullah and Wachira (2003, p.5-7) pointed out that the informal sector is a large and growing sector in most developing countries, especially during periods of economic recession. These views indicate that informal construction will play

an important role in the production of the physical built environment in most developing countries.

The informal sector is currently seen as an important part of the national industry in most developing countries owing to its significant role in employment, the supply of construction materials and labour, and the production of the built environment.

2.4 Demand and Supply in the Construction Industry

According to Cooke (1996, p. 21), demand and supply refer to "the willingness and ability of householders, firms, local authorities, the government or any other economic agent to buy (in the case of demand) or sell (in the case of supply) goods and services over a predefined period of time". Demand in the CI is associated with the requirements and expectations of clients, and influences many other sectors. Also, each demand for construction has specific characteristics in terms of location, time, type, scale, nature and value, as well as specifications and quality (Sugden, 1975, p.1). As a consequence, according to Ball (1988, p.111), "demand does play an important part in determining the nature of the CI".

In general, the demand for construction can be classified in many ways, such as demand for housing construction, buildings and infrastructure works, or new construction and maintenance and repair. Ive et al. (2000 p.97) argued that demand for construction consists of a mix of consumer demand and investment demand; both respond to and are affected by changes in the economic environment. According to Hillebrandt (2000), there are four key persons or institutions involved in the demand process: the initiator, the client, the financer, and the user. Generally, in most developing countries, a significant proportion of formal construction demand is generated by government and the public sector.

Therefore, it can be said that demand for construction is the fuel of the CI; the volume of operations of the industry is heavily associated with the demand for construction. In addition, demand for construction is a dynamic process which is subject to fluctuation and change in terms of type, nature, location and scale. It also affected by geographical and climatic circumstances in terms of distribution and construction seasons.

According to Gruneberg and Ive (2000, p. 144), "supply is defined as the quantity sellers, usually firms, are willing and able to offer for sale in a given period" To

Hillebrandt (2000, p.89) "the supply of construction is provided by consultancy practices, and firms from many industries, including contractors and materials and plant manufacturers". However, supply for construction can be provided by owner-built and informal supply channels, as addressed in section 2.3.4. Cooke (1996, p. 40) argued that the most significant factors influencing the supply of construction products are: changes in construction technology; the structure of the industry; the number of operative firms in an industry; the number, types and prices of products and services that are supplied by producers at a given time; the objectives and behaviour of supplying firms; the confidence of suppliers in the market; the perceptions of suppliers about the future market; and the stability and overall performance of the economy. Furthermore, the characteristics of the geographical, political, social and economic environment, the structure, nature and location of construction activities, natural and man-made disasters, procurement systems and contractual relationships, the degree of state intervention in construction, the supply and distribution of construction inputs and services are also key factors affecting the demand and supply of construction products. Furthermore, in most developing countries, the size, relationships and overlaps between the formal and informal sectors are also two key factors influencing the supply of construction products, as mentioned in section 2.3.4

In short, the supply of construction products and services is provided by individuals, and formal and informal firms involved in construction processes and operations. The processes of supply are based on a construction project and conducted by firms, and are affected by the context where the industry operates. In the following sections projects and firms in the CI are highlighted.

2.5 Projects in the Construction Industry

This section provides a brief outline regarding projects undertaken by the CI. Therefore, the types of projects and their general characteristics are highlighted.

2.5.1 Type of Construction Projects

The CI is a project-oriented industry where processes and operations are based on and organized around construction projects (Moavenzadeh, 1987, p.75; Love et al. 1998, p.723). According to Halpin et al. (1992, p.1), "construction is traditionally carried out in a project format". To Kwakye (1997, p.21), a construction project is:

> "A task undertaken in the production of a construction product. The term project in this context is being used for the total activity from inception to commissioning and occupation, involving an agreed and planned objective and the total input of specialist participation and their relationships".

Harris et al (2001, p.74) defined a project as all construction activities ranging from acquisition of land to production and use of the facility. In practice, projects can be categorized into residential projects (individual private homes, apartment complexes, public housing, etc.); non-residential projects (office buildings, educational and clinical buildings, etc.) and infrastructure projects (highways, roads, dams, harbours, etc.). Also, projects can be classified into new construction, maintenance, repair, development, transformation, alteration and demolition projects. Added to this, projects can be classified into local, national or international construction projects, and micro, small, major or large projects. According to Griffith (1992, p.22), small/minor building projects in the UK industry are "those building works procured under a standard shorter form of building contract". These projects include minor and small construction works such as the maintenance, alteration or modernization of buildings or other structures. However, according to the Major Project Association (MPA, cited in Potts, 1995, p.4), major or large construction projects include "any collaborative or capital project that requires knowledge or resources that exceed what is readily or conventionally available to key participants". These projects include large and sophisticated buildings and infrastructure works, such as industrial buildings, power stations, highways, underground infrastructure projects, etc.

In short, a construction project is a task proceeding from a conceptual phase to occupation. Classifications of construction projects vary owing to their scale, nature, functions, and location. In this study a construction project is seen as the overall processes and operations from the client's brief to handing over of the project.

2.5.2 Characteristics of Construction Projects

Clough et al. (1991, p.2) tell us that "each construction project is unique, and no two jobs are ever quite alike. In its specifics, each structure is tailored to suit its environment, arranged to perform its own particular function, and designed to reflect personal tastes and performances". Olsson (1998, p. 503) indicated that "each construction project is different, the workforce is transient, multiple crafts are involved, projects are planned and worked in short time frames and there is a tremendous quantity of materials and equipment that must

be installed". Consequently, any construction project is unique in terms of its goal, features and the parties involved in its operations.

Wells (1985, p.337) argued that decisions to use labour, materials and construction methods in construction are largely determined at the design phase of a project. Therefore, according to Lethtonen et al. (1998, p.689), what is unique in construction projects is that the output is different from project to project, but the information and material supply are largely the same in each construction project. This implies that projects and their associated processes, operations and documents are an important source of data and information about the general characteristics of the industry and its operations. Thus, it can be said that each construction project is a unique phenomenon in the CI. It has its own circumstances and features in terms of client, design, procurement methods and production and operations processes.

2.6 Firms in the Construction Industry

The purpose of this section is to review the role, features and resources of suppliers or firms in the CI.

2.6.1 Theory of the Firm

According to Harris et al (1989, p.168) a business or firm is "simply a fairly efficient way of combining the skills and talents of people into an organization that can produce the goods and services in sufficient quantity to satisfy the material desires of the community in which it exists and at the same time provide a sufficient return on the capital invested". Brazel (2002) stated that "the firm is simply an organisation that selects (the optimal) points on the production function, acquires the necessary inputs, transforms them according to the production function into outputs, and sells that output". Whitley (1993, p. 2) saw a firm as "the collective organization which transforms human and material resources into productive services in different ways". Hillebrandt (1985, p.86) indicated that the traditional theory of the firm is based on the maximisation of monetary profit, adding that, without maximising profit, the firm could not survive and stay in the market. However, there is a view which argues that profit maximisation is not the only objective of a firm; gaining reputation and achieving growth could be long-term strategic aims.

Consequently, a firm is a dynamic and flexible organization. Therefore, its strategies, objectives, size, organization and activities are subject to change over time in response to

political, social, technological and economic circumstances in its operating environment. Simon (1997, p.107) indicated that the business behaviour of a firm is subject to change during its development. This enables the firm to survive and grow. Furthermore, the behaviour of firms is determined by the environment within which they operate; this includes economic and political circumstances, the status of the construction industry, and the nature and structure of demands made upon it (Hillebrandt, 1995, p.13). Within the definition of the term 'industry' in section (2.1), the CI comprises small, medium-sized and large firms.

From the above, it seems clear that a firm is a production and supplier unit which mainly relies on the skills, knowledge and experience of people. As both Hillebrandt (1985, p. 87) and Forster (1989, p.3) argued, a key goal of a firm's strategy is to achieve profit, survive and grow. In this sense, a firm is a dynamic organization. However, Edum-Fotwe et al. (1996, p.189) indicated that "contractors companies must therefore undertake regular evaluation of their performance in order to ensure the adoption of timely and appropriate strategies to survive in business".

2.6.2 Types and Roles of Firms

There are several ways to classify firms in the CI, including general contractors, specialist and subcontractors firms, small and large firms, or local and foreign contractors. For example, the World Bank (1984, p. 29) classified firms or production units in the CI into jobbers or builders, self-help organizations, state-owned companies and organizations and private local and foreign companies. Gruneberg and Ive (2000) stated that in the UK construction industry:

> "there are hundreds of thousands of construction firms: from large to very small; from general contractors to specialist; from those selling direct to the industry's clients to those selling to other construction firms; from partnership to stock market listed public limited companies; from firms employing highly qualified professionals to those employing unqualified labour".

In general, these types and relationships exist in any contemporary society. Moreover, Hillebrandt (1985, p. 85-86) classified construction firms in the UK construction industry into the following types: partnerships firms, private one-man businesses, and limited liability companies. Also, Briscoe (1988 p. 62-67) categorized construction firms into: sole tender firms, partnerships, limited liability companies, public limited companies,

consortia of firms and direct labour organizations. The literature shows that these types of companies are common in most countries.

Since this study seeks to identify the general characteristics of the LCI and its firms, it is essential to highlight the role of the most important firms in the processes and operations of the CI. Broadly speaking, it can be said that consultancy firms or designers formulate the client's brief and convert his/her requirements and expectations into design drawings in accordance with planning procedures, permissions and design and construction standards. According to Franks (1990, p.5), designers or consultants are the leaders of the whole construction process; where the critical design decisions such as determining type and interaction between design, equipment, materials and labour are taken as well as where the procurement methods in a project are usually decided. Furthermore, consultants are considered as the bridge which allows communication and information between project parties and clients to flow smoothly and efficiently (Bright, 2002, p.11). However, the role of designers or consultants firm is determined by the contractual relationship with the client and contractors, as well as by the nature and size of the project.

Traditionally, the general role of construction firms is to translate drawings produced by designers into buildings or functional structures. This role often starts after the designers have completed the design of the project. A client of a construction project invites competitive tenders from construction firms for constructing the project. Generally, the lowest tender for the project is then used as the basis to award the work to a contractor from a group of construction firms (Bennett, 2000, p.32). In such construction procurement systems, construction firms are not widely concerned with design or the production of materials and components (see 2.8.2).

However, there is a view which argues that construction firms can offer more services to clients than merely construction. In this regard, Ofori (1994) argued that the role of construction firms in the CI should go further than its traditional one as a constructor, towards investing in human and capital resources as well as sharing in research and development efforts. He suggested that this investment would increase the overall performance and capability of construction firms. Furthermore, over recent decades in the UK and many other countries, a large number of construction firms have been involved in design and the building management of construction projects, financial packages, equipping the buildings, repair and maintenance contracts and the management and operation of

facilities (Hillebrandt et al, 1990, p. 22). As discussed in sections 2.3.3, partnering in construction enables contractors to be involved in all phases of construction projects and operations.

From the above, the CI generally comprises a large number of firms which vary in their role, scope of work, size, and organization. Consultancy and construction firms are key pillars of the CI. The roles of these firms in the CI vary in terms of involvement in planning, design, construction and operation of the project. This is usually determined by the construction procurement systems.

2.6.3 Size of Firms

In general, the size of firms in the CI is measured by several indicators such as turnover, number of staff employed, workload and size of projects undertaken. Therefore, the gap between small and large firms in terms of numbers of employees, size of workloads and value of turnover, as well as administrative, financial and technical capability, is very wide. Generally, firms in developing countries are classified into large and small firms; the first comprises international contractors (usually working in large projects); joint venture contractors and state owned companies, and private firms (engaging in large and medium projects); while the second are small local firms varying in terms of size and workload which are involved in small works (Ofori, 1991, p.19; Druker and White, 1996, p. 8; Gruneberg and Ive, 2000 p. 62; Edmonds et al. 1984, p.24). Added to this, there are many informal small firms involved in manufacturing, supplying and subcontracting of works in the CI (see 2.3.4).

According to Hillebrandt and Cannon (1990 p. 39), the increase of a firm's size is associated with its ability to achieve growth and diversification in its activities. However, the literature on the CI shows that, over the past two decades, there have been two key changes in the features of firms in the CI. Firstly, large firms have changed into smaller firms; and secondly, subcontractors firms have increased. Reinecke et al. (2004, p.4), stated that "large private enterprises, whether domestically owned and operated or part of a multinational conglomerate, have also been affected by rapid market changes. These changes have required enterprises to operate more efficiently and competitively. The previous advantages of size, such as large stock inventories, hierarchical staff structures, and financial reserves, have been reassessed". Willis et al. (1999, p. 9) attributed this shift from large to small companies in the UK construction industry and the reliance of general contractors on

subcontractor firms as a consequence of changes in the role of contractors from "design-bid-construct" projects to design and build (see 2.8.2). In the light of these changes, it is evident that small and medium firms play an important role in social and economic life. Consequently, it is nowadays well recognized by researchers and policy makers that small firms have a significant role in social and economic development.

The classification of small firms varies from country to country owing to the political, social, and economic environment as well as the structure of the industry. Burns (2001, p.11) classified small firms in terms of operational strategies into: lifestyle firms which operate in accordance with owner-manager satisfaction to generate an adequate income, and growth firms which are started up in order to grow. Generally, there is a view which argues that "small firms exhibit a higher profit rate, lower survival probability, and have difficulty in accessing the capital market" (Dhawan, 2001, p. 270).

To conclude this section, it can be said that the size of a firm depends on the number of employees, turnover, workload, scale of projects and the firm's resources. Generally, the vast majority of firms in the CI are small. Over the past two decades, the number of small firms and subcontractors has increased remarkably owing to rapid changes in procurement systems and markets.

2.6.4 Resources of Firms

Griffith (1992, p.40) and Clough et al. (1991, p.21) have classified the key resources of construction firms into four categories: physical resources (offices, workshops, equipment, machinery, materials, etc.); financial resources (cash flow, liquid capital, firms' financial stability, etc.); personal resources (workers, staff, range and level of skills, etc.) and management (level of management skills, administrative capability, etc.). Hillebrandt and Canon (1990, p. 115) argued that the most scarce and important resource in construction firms is management. They attributed that to the fact that a firm's physical resources, project progress, operations of production units, supply of construction materials, coordination between the firm's departments and other industrial relationships are based on the decisions and relations which rely on management. However, Bennett (2000, p. 9) argued that "the nature of the CI depends on the way managers in the industry choose to view their work"

Thus, the efficiency of any firm in the CI generally depends on the managerial capability of its managers or leaders to utilize the above resources in order to achieve the firm's strategic goals, and which allow it to survive, develop and grow.

2.6.5 Subcontractor Firms

Fryer et al. (1996, p.50), Dubois et al. (2000, p.207) and many others have argued that one of the major features of the CI in the twentieth century was the growth of sub-contracting. Hong Loh and Ofori (2000, p.29) indicated that, nowadays, the capability of the CI and their construction firms in many countries relies heavily upon subcontractors. Loosemore et al. (2003, 278) pointed out that, in the UK construction industry, "most large construction companies have undergone a period of significant organizational change over the last 20 years and have effectively become managers of the construction process". Tookey (2004, p. 212) attributed the increase in subcontractor firms since the turn of the 19th century to the rapid changes in production systems, from site production to the assembling of many materials and components on site. In addition, the size and complexity of construction projects, the low capacity of the main contractors, and their desire to narrow the duration of construction projects, to achieve low costs and to avoid the risks in large construction projects are also important factors.

Furthermore, the subcontracting system allows small and medium firms to be established, and enables them to survive and grow. It also enables the size of the main contractor's staff and capital outlays on plant and equipment to be reduced (Twort et al, 1995, p.74). In addition, it offers more flexibility to the main contractors, allows their workload to be expanded without any increase in firm size, and enables them to transfer some of the projects' financial risks to subcontractors (Harris, et al. 2001, p.117). Moreover, the subcontracting system is a significant way to mobilize human and financial resources. Generally, subcontractor firms can be classified into two types in terms of selection methods: a nominated sub-contractor, which is usually appointed by the client or its representative; or a domestic subcontractor, which is assigned by the main contractor and is responsible for supplying construction materials and workers for the whole or a part of the project (Bentley, 1987, p.7). The scope of activities of subcontractors includes labour and materials subcontracting. However, inefficiency, low productivity and the general quality of subcontractor's work may cause delays and increase project risks.

Subcontracting systems are one of the key features of the CI. Over the past decades, subcontractor firms in the CI have increased, and the most important reasons behind this increase are changes in production modes, and the tendency of main contractors to avoid administrative and financial risks. However, in spite of the role of subcontractors in the operations of the industry and its increasing capacity and capability, inefficient subcontractors are a key source of low productivity, low quality and delays in projects in the CI.

2.7 Construction Resources

As mentioned in section 2.6.4, according to the World Bank (1984, p.41) the main construction resources or inputs in the CI are management, manpower, equipment, materials and capital. Meikle (2001, p. 263) argued that construction resources or inputs are of two types: firstly, consumed resources (inputs), which are consumed in the production process and its related operations and activities, such as buildings materials; and secondly, resources which are considered as fixed capital, such as equipment and machinery. Groak (1992, p. 122) classified construction resources into: land; the existing stock of the built environment; materials and components; energy; manpower; equipment, plant, and tools; and finance. The choice of construction inputs is mainly attributed to the type of project, the client's desires and objectives, the way the project is designed, the technical possibilities of construction methods and the costs of these inputs (Hillebrandt, 2000, p.184). Furthermore, it should be added that geographical and climatic circumstances and construction traditions and culture should also be considered as important construction resources or inputs.

In developing countries, a significant proportion of construction resources is imported, particularly of construction materials, machinery and equipment as well as high level skills. Adams (1997, p.95) attributed the low capacity of the domestic construction industries in most developing countries to their reliance on imported construction resources. Also, these resources are obtained from several participants and sectors of the economy. On the other hand, the vast majority of resources are generally managed by government, including land procedures, construction regulations, specifications and import controls, manpower laws, safety regulation, bank credits and the taxation system. In the following sections brief outlines are provided of the five most important construction resources.

2.7.1 Construction Land

The availability and affordability of construction land are of significance in promoting investment in construction. However, this resource is associated with several factors, such as the role of the state in the land market, land polices and types of land ownership (see 3.5.2). In some developing countries, the cost of land compared to the total cost of construction output is a serious obstacle to the operations of the CI. For example, in Jordan, the cost of land makes up more than 50 per cent of the total cost of a housing unit in Amman (Al-Adhami, 1995, p. 4). In Libya, it makes up to 60–65 per cent of the total cost of a private housing unit in Tripoli. Furthermore, lack of construction land and the inaccessibility of construction sites in terms of communication and infrastructure services were the major obstacles said to have restricted the implementation of large public housing projects in Libya over three recent years (General Corporation for Housing (GCH), 2000, p.19). The price of construction land is affected by its location, immediacy and accessibility, the cost of construction products and soil grade, shape and size (El Araby, 2003, p.431). Thus, it is clear that land is an important construction resource for the CI and its associated processes and operations. Therefore, planners and operators should also pay close attention to the negative impacts of construction on land and the environment. For instance, Morel et al (2001, p.1119) argued that, "throughout the world the building industry is responsible for high levels of pollution as a result of the energy consumed during extraction, processing and transportation of raw materials". In this context, Spence (1995 p. 280) indicated that "the CI pollutes the environment by its activities, waste materials, gases, dust and particles from construction sites and production of building materials". It is clear that the CI has negative impacts on the land and natural environment.

2.7.2 Building Materials

Building materials are a key resource for the CI. Construction and installation materials account for more than one-half of the total cost of construction products (Hellman, 1996, p. 221). According to Moavenzadeh and Hagopian (1983, p.25-26), the nature of construction technology, the value of investments, and construction workers and equipment to be used are determined by the characteristics of construction and building materials. In addition, demand for construction-related materials and components is usually correlated with the demand for construction. Added to this, the nature of demand is associated with the intensity of construction activities, changes in construction technology and in building materials and prices. Hillebrandt (1988, p.184) argued that the selection of

building materials is attributable to the client's desires, the way the project is designed, methods of construction, and the costs implied in these decision. As mentioned previously, in most developing countries, the CI relies heavily on imports of construction materials (see 2.7).

The supply and distribution of construction related materials is an important sub-sector of the CI. Therefore, irregular and slow supplies of construction and building materials, shortages of materials in the construction market, changes in the types and specifications of materials, and the wastage of materials, are important causes of delays in construction projects in most developing countries (Mezher and Tawil, 1998 p. 5). Thus, the availability and affordability of construction and building materials have a direct impact on the operations of the CI. Therefore, in most developing countries, there has been growing concern regarding the importance of developing local and indigenous construction materials. In this regard, Harrison (1995, p. 211.) argued that, in developing countries, appropriate building materials should be indigenous, locally available, and low energy in terms of production, operation, maintenance and transportation costs, and they should be labour-intensive.

In short, construction-related materials and components are important inputs in the production and operational processes of the CI. Shortages or irregular supplies of materials will affect production and operations in projects and hence the overall performance of the CI.

2.7.3 Manpower

Construction labour is a crucial factor in the operations of the industry. According to Gruneberg (1997, p.126), labour is a key factor in any production process. Construction production and operations processes cannot take place without labour. To Agapiou et al., (1998, p.149), "the availability of labour is a major consideration in investment decisions" Ive et al. (2000, p.45) classified employment in the CI into permanent employees (administrative and technical staff), and casual and self-employed workers, as well as labour subcontractors. However, employment in the CI is characterized by its temporary nature. As a result, instability is one of the main features of employment in the industry (Uwakweh and Maloney, 1991, p.451)

There is a general impression which sees developing countries as rich suppliers of construction labour (Ofori, 1994b, p.44). However, construction workers in these countries are characterized by a scarcity of skills (Uwakweh, 2000). In addition, such construction workers are characterized by low levels of productivity, and most are unqualified and untrained and need more qualifications to become productive workers (Jaselskis and Talukhaba, 1998, p.186). Therefore, casual employment is a main characteristic of the CI.

There is also a common view which argues that labour-intensive construction methods or techniques are more suitable than capital–based methods, particularly for developing countries. Moavenzaeh and Hagopian (1983, p. 23) attributed this view to the following reasons. Firstly, labour–intensive methods generate a great chance for employment. Secondly, they distribute income to a large number of informal workers. Thirdly, labour–intensive methods can be utilized to enhance the development of the manufacturing of construction tools and equipment, local building materials and the domestic construction industry; and fourthly, these methods are a means to conserve the national stock of hard currency. Hillebrandt (2000, p.188) agreed, arguing that the major reason for using labour–intensive construction techniques is to increase the level of employment and GDP. In addition, the use of indigenous materials requires little plant and equipment. However, these methods need intensive management and may also cost a lot of money and time.

To sum up, it can be said that labour is an important resource in the CI. The level of productivity, the efficiency of operations and the overall performance of the CI are strongly associated with the affordability and quality of construction workers.

2.7.4 Construction Technology

According to Ofori (1994a, p.379), the term technology is "the application of the existing body of knowledge (science) to the production of goods and services". In this sense, technology manifests in the CI itself in construction equipment, machinery, tools, techniques, systems, processes, and materials, as well as in information and organizational operations and skills. Drewer (2001, p.70) classifies construction technologies into four categories. "Hard technologies are those that relate to the product and its production as tangible entities. 'Soft' technologies are those that relate to the associated systems and processes. 'Product' technologies are those embodied in completed construction products. 'Production' technologies are those that actually achieve these products". The selection of

construction technologies usually starts in the early stages of the construction process (see sections 2.6.2 and 2.8.1)

A review of the literature on the CI shows that most developing countries have imported construction technologies in order to meet their construction demand and achieve their national aspirations (see 2.7). Therefore, the transfer of construction technology is one of the approaches the CI uses for its development in developing countries. Ofori (1994a, p.389) stated that, in developing countries, technology transfer helps to improve the operation of the CI. He argued that technology transfer is a first step in a long sequence of actions which ends when the technology transferred has become integrated into the host country's circumstances. Furthermore, he indicated that such technologies should be selected carefully, and government departments and local research centres have a significant role in this improvement process. Devapriya and Ganesan (2002, p.180-181) pointed out that, in developing countries, technology transfer can increase the capacity of the national industry and support economic growth. However, they argued that transferring technology through a single project is probably not an efficient approach in improving domestic industries, because the transferred technology has only been employed in one project. However, it is argued that construction technology should be integrated with geographical, climatic, social, economic circumstances and the levels of workers' skills.

Thus, construction technologies are the means by which construction resources are manufactured and transformed into physical construction products. Owing to the low technological and technical capabilities of most developing countries, the transfer of technology is an approach which has been adopted to increase the capacity and capability of the domestic construction industry. However, experience shows that, in many cases, these technologies are not appropriate to the geographical, social, economic and technical context of the developing countries.

2.7.5 Construction and Project Management

As mentioned in section 2.6.4, management is the most scarce and important resource in developing countries. According to Halpin et al. (1980, p.2), construction management comprises "the planning and delivery of the construction process required in a specific project. The nature and scope of the construction management effort will depend on the technological complexity and magnitude of the construction efforts and on the business, and organizational environment established between various agents involved in the project

and construction process". Abdul-Kadir and Price (1995, p. 390) pointed out that "project planning is the global planning of the whole project, including the establishment of and commitment to defined schedules and milestones". Brown et al (2000, p. 239) argued that "the primary function of the building project management discipline is to organize and manage projects in order that they can be delivered to the required specification for the lowest achievable cost within the minimum achievable timescale". To Kartam et al (2000a, p. 281), "construction management is concerned with management efforts during the construction stage. Project management deals with the entire project life cycle from feasibility study to design, procurement, and construction until start up and operation". Chan et al. (2002, p.23) indicated that, in the construction management literature, a project is regarded as "successful if the building is completed on time, within budget, without accidents, to the specified quality standards and overall client satisfaction". Hore et al. (1997) indicated that the construction manager is responsible for the management of project resources (materials, labour, machines, money) in order to maximize their use, to reduce their cost and to hand over the project within its duration and budget. From the above, construction and project management are the means by which projects are organized and operated with the aim to deliver the client's construction requirements in accordance with criteria of quality, cost and time.

However, a review of the literature shows that the CI in most developing countries lacks the efficient application and practice of project management. For example, Kartam et al (2000a, p. 294-295) studied professional project management in the Kuwait construction industry. They concluded that the perceptions of clients concerning the significance of project/construction management ranged from good to bad. Additionally, they found that the implementation of project/construction management was restricted by several obstacles such as complex and long approval procedures, patterns of client administration, ambiguity in user needs, a lack of delegation of authority in adopting project/construction management, changes in the scope of work, and the effect of political forces. Furthermore, they provided a set of suggestions to upgrade the implementation of project/construction management in Kuwait, including reviewing and revising the rules and regulations as well as procedures for selecting contractors, focusing on training in those aspects relevant to project and construction management, and that the authorities should delegate more to project/construction management. Al-Sedairy (2001, p.161) went further, and argued that

there is a need to change management approaches in Saudi Arabia's CI owing to the changes in the economic environment in recent years.

From the above it is clear that construction and project management is an essential approach and practice vital for the efficient operations of the CI. However, in most developing countries the implementation of construction/project management is characterized by poor and inefficient practice. In some Arabic countries, the application of project/construction management has been constrained by political, social and technical obstacles. Consequently, to enhance the operations of the CI, close attention and more effort is needed in training in project/construction management.

2.8 Construction Processes and Operations

Turin (1980a, p.281-282) argued that the construction process starts from:

> "the initial decision to build taken by the client through the location of the building in relation to space, the securing of financial resources, the designation of the members of the design and building teams, the precise definition of the object to be built, the decision on how to build, to the implementation of all decisions and organization of the operations required to maintain the building in a state of performing the function for which it was designed or to adapt to new functions".

According to Hakim (1988, p.102), the construction process consists of "those actions, events, and decisions which have direct influence on the building activity". Halpin et al. (1992, p. 2) stated that the construction process is "a unique collection of work tasks related to each other through a technological structure". Bennett (2000, p. 156) argued that construction can be seen as a coordination process aimed at producing construction goods and services. In the light of the previous definitions, it can be said that the construction process is a series of sequential actions and operations including briefing, design, documentation, tendering, contracting, and construction and commissioning.

As discussed in sections 2.6.4 and 2.7, the basic inputs to a construction process are land, finance, materials, labour, plant and machinery (Ikejiofor, 1997, p.418) in addition to knowledge and construction traditions and cultural values. These resources must be managed efficiently to ensure that the required quality of products is achieved. A large part of the operations of the construction process occur in open environments. As a consequence, it is subject to influence by weather conditions and many other environmental

factors which affect the supply of construction resources, labour and equipment and their productivity (Mohamed, 2001, p.87). Clough (1991, p.2) also argued that the construction process is subject to influence by unpredictable variables and factors". Furthermore, Al-Momani (2000, p.648) found that, in the Jordanian construction industry, the absence of cooperation between clients and contractors during the construction process, and the involvement of contractors in the early phases of the design process, were two major obstacles restricting the construction process and its related operations. He suggested that improving communication skills during the design and construction phases would help such obstacles to be overcome.

The construction process and its associated operations can be organized and operated in several ways. For example, Hillebrandt (1988, p. 48) pointed out that, in general, the client's needs, expectations and experience, the type and scale of the project, the client's project management team, available construction resources and technology, the managerial, technical and financial capability of firms, construction and contractual laws and regulations and the political, social and economic environment within which the industry operates are the key factors which determine the type of organization and structure of the construction process and its related operations. Generally, the efficiency of the construction process and its associated operations depend on the organization and contractual relationships between participants involved in the whole process (Hillebrandt, 1988, p. 39). Furthermore, it depends on the sources, quality and flow of information, and successful communication channels for the decisions that are made by participants.

On the whole, the construction process and its related operations are large, long and compound processes. The pattern and efficiency of the processes rely on the characteristics of the key actors, the operating environment, organization, communication channels, the quantity, quality, time and flow of information, and relationships between key actors and operatives. The following sections review the influence of the external factors such as the geographical, social and economic characteristics, the role of the state, clients, consultants and contractors in the industry's construction processes and operations, and the main phases of the construction processes.

1. Geographical, Social and Economic factors

According to Groak (1992, p.36), geographical and climatic conditions influence construction in three ways due to the effects of the three permanent concerns of climate physical topography and building materials. Furthermore, Cooke (1996, p. 41) argues that the weather has a significant role to play in determining the supply of construction products. In addition, it is generally recognized that climatic circumstances are one of the most important factors that influence labour productivity (Rojas et al, 2003, p.19). Furthermore, the geographical factors have direct and indirect influence on social and economic environment where the CI operates. For example, Elshukri (2000, p.316) argues that:

> "Arid and semi-Arid lands have a social and cultural identity which moulds behavior and needs. People who have lived for decades in such conditions use their local environment in radically different ways from people in Western societies".

In brief, it is clear that geography has an important influence on the CI and its related processes and operations. Construction materials and technology to be used is probably liked to the geographical and climatic context. Furthermore, social and economic environments where the CI operates affect the organization and structure as well as operations of the industry. Ive and Gruneberg (2000, p.180) argued that "the way that any industry organises itself is a collective response by the firms of that industry to their economic, social and political environment". According to Tipple (1993),

> "The major determinant of construction activities is the strength of the growth in the national economy and that economic strength is also dependent on a strong construction industry"

Furthermore, Bhalla and Edmonds (1983, p.196) tell us that, in countries which have a high GNP per capita, the contribution of the CI to GNP is higher than in those countries which have a low GNP per capita. In general, it can be said that investment in construction is strongly correlated with increases in GDP. Thus, it is clear that, geographical, social and economic issues are important external factors which affect the CI and its associated processes and operations.

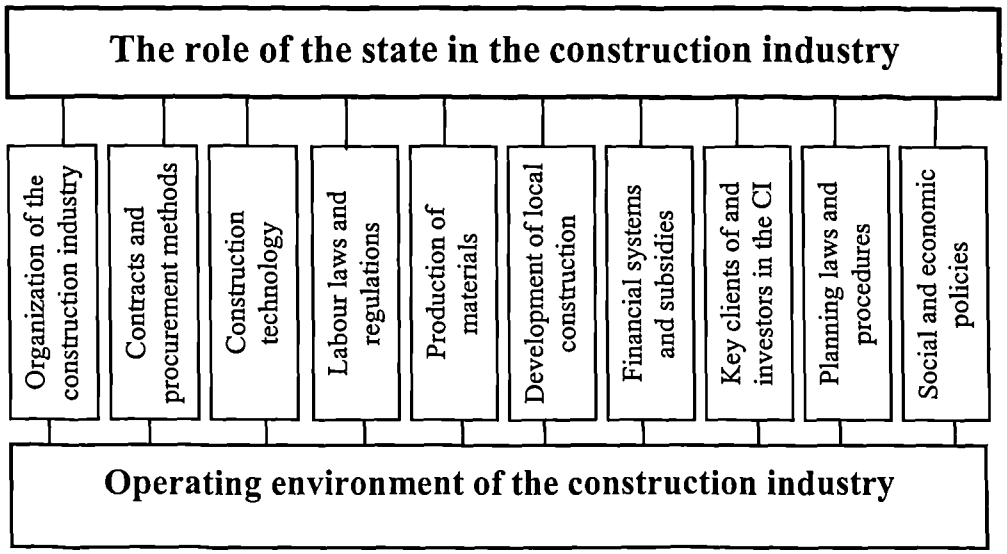
2. The Role of the State in the Construction Industry and Contractual Regulations and Restrictions

According to the World Bank (1984, p.54),

> "The construction industry cannot develop without a government's commitment and long term active support. Without this, any improvements achieved are local and temporary".

This may be attributed, in part, to the fact that governments and their departments in most countries are the major clients of most construction projects. However, the state's regulations and restrictions can restrict the operations and development of the industry. Hillebrandt (1985, p.73), Wells (1986, p.79-83), Ofori (1994b, p. 48), Fox et al. (1999) and many others have indicated that governments have a significant influence on all aspects of the CI through their strategies and policies regarding the establishment and organization of the administrative, legal and institutional framework. These include generating and controlling demand and supply through social and economic planning, construction, financial and monetary policies, decisions and actions relevant to the industry's operating environment, and government structure and institutional frameworks. Figure 2.1 summarizes the role of the state in the CI and its processes.

Figure 2-1: Role of the state in the CI and its effect on its processes and operations



Source: compiled from: World Bank (1984); Wells (1986); Hildebrandt (1984, 1988); Ofori, (1994b), Kwakye (1997) and Fox et al. (1999) and many others.

Added to the above, some governments have a key role in moderating the construction market through their policies, their involvement in construction activities as a key client, promoting the development of domestic contractors by offering fair bidding, protecting them from the intensive competition from foreign contractors, and giving direct access to financial services, credits and imports of construction inputs and equipment. Furthermore, the state has a role to play in improving local construction technologies, supporting research and development, disseminating and transferring construction technology, developing local building materials and human resources, and controlling and eliminating the negative impacts of the CI on the natural and built environment, particularly in developing countries (Ofori, 2000c).

From the above, the state has a significant role in the CI. It is the major client of construction output, particularly of infrastructure projects. Added to this, it regulates and restricts the industry's organization, construction processes and operations, and creates the industry's operating environment.

3. The Client's Role in the Construction Industry

According to Fisk (2000),

> "Whether the project is a building, bridge, dam, pipeline, sewage treatment plant, water supply system, or any one of numerous other types of projects, it requires the skills and services of a project team compromised of three principals: the owner, the designer, the builder".

Moavenzadeh (1978, p.98) argued that "the participants in construction are traditionally divided into three groups: the clients, the professionals and the contractor sector". In section 2.6.2, the role of consultants and contractors are briefly highlighted. In this section, the role of the client is briefly outlined. Hillebrandt (2000, p.73) claimed that "the initiators of the whole process are the clients of the industry". The client leads the design activities, determines the timing of projects and the procurement methods and selects designers and contractors (Bishop, 1975, p.84). Furthermore, the client decides the procurement path for construction works, which is considered as one the most of important decisions in the whole construction process (Nogowi, 1998, p.343). Ahmed et al. (1995, p. 36) added that the client is the "one who pays the bills". The previous statements confirm the important role of the client (public or private) in the whole process and operation of the CI.

The briefing process is one of the key roles of clients and is based on the client's views and perceptions. According to Bennett (2003, p.47), the brief is "a statement that specifies the scope of the project. It defines the objective to be achieved and lays out in a general way what the final product will accomplish". Dikmen et al. (2005, p.246) indicated that client needs and expectations collected during the briefing process are used by designers to provide the correct design solutions. Hillebrandt (1988 p.50) pointed out that the client's indecision will increase the cost of the project, and create doubt for the contractor. However, Bright (2002 p.11) argued that many clients of construction projects are able to make products and market decisions, but they lack the experience and ability to make project decisions. Therefore, poor briefs are likely to guide actions, processes and operations, as well as the construction of the project, into risky situations. Added to this, the final product will not meet the clients' expectations. Al-Momani (2000, p.644) pointed out that the two main obstacles restricting the briefing process and project success are clients being inexperienced in the CI, and the lack of mutual understanding of construction in terms of needs, methods, technologies and cost. As a consequence, any wrong decisions made earlier in briefing, planning and design processes are expensive to change. Therefore, the careful definition of a client's objectives and expectations is required, and the responsibility of each participant at the pre-contract stage must be clear (Kwakye, 1997, p.22).

Based on the above, public and private clients have a vital role in the CI. Without clients, construction demand cannot be generated, and projects cannot be funded. The first and most important role of the client is the project brief, by which designers translate construction needs and expectations into a real construction project. However, the inexperience and incapability of clients to make efficient decisions and provide a complete and real project brief may affect the operations of the CI.

2.8.1 Pre-Contracting Phase

In this context, the pre-contracting phase refers to the planning, design, estimating, tendering and contracting stages. Critical decisions are taken in this phase. For the purpose of the discussion and analysis in this study, the design, estimating, tendering and contracting stages are briefly highlighted in the following sections.

1. Information and Communication in the Construction industry

Condreay (1996, p.77) stated that:

> "Construction is an intensive data (information) driven service industry. The entire process of estimating, scheduling, planning, tracking, document control, construction, management, and supervision of a construction project is simply the accurate and timely gathering and sharing of information with others".

There is view which argues that communication systems have been considered to be one of the key problems in the CI. In turn, according to Turner et al. (2004, p. 355), "communication can help build up trust on a project, and a breakdown in communication can lead to a breakdown in trust". Therefore, efficient communication systems, technologies and channels are key variables in construction and the operational processes of the CI. Lockyer and Ordon (1996 p. 40) argue that "communication in any organization is critical to its success". Generally, communication in construction is affected by the social and cultural context, the communication channels and technology used for access to information, and the simplicity, clarity, quantity, quality and timing of the delivery of information.

Furthermore, information can be supplied by formal and informal channels. Formal communication usually takes place through official channels and is based on specific agreements and rules, while informal communication mainly depends on verbal information, such as in face–to-face conversation and personal contact (Otter et al. 2002, p.164). Added to this, communications technology varies in terms of means and efficiency in conveying information on time. These include traditional communication techniques such as letters, reports, comments, etc., wired communication technology including telephone, fax, email, other internet links, etc; and wireless communication comprising voice communication, mobile data, radio services, micro wave, satellite-based communication, etc. (Garza et al, 1998, p.334). The type of communication technology used in the CI is generally associated with the personal characteristics of the staff and operators, the size and nature of projects, the development of the communications network and the geographical and climatic conditions of the context where the CI operates.

In recent decades, rapid changes in the information and communications environment have led to the use of information technology (IT) in the CI. Generally, the application of IT in the CI improves and accelerates communication process, the types and

formats of information, and the quantity, quality and flow of information. Gruneberg (1997, p.201) pointed out that management functions in the CI have been altered by information technology. Husin et al. (2003, p.509) indicated that "the birth of Internet-based computer-aided design (ICAD) solutions has offered a new dimension to architectural practices".

Information in construction is produced and supplied in different formats, including language, numerical, graphic data and information such as letters, notes, reports, drawings, sketches, documents, regulations, and specifications. Traditionally, the majority of the data and information in construction have been quantitative and paper-based sources. However, recently, use of visual and electronic data and information has been increasing. The transformation and flows of information between all parties engaged in operational activities depend on communication systems and channels. Consequently, efficient communication systems and networks are key factors in improving the different operations of the CI.

2. Design Phase

Otter et al. (2002, p.163) define the design process as "the management of information handling between the participants in the design team". In the opinions of many researchers, the success of the design process in any project is associated with the efficiency of information and the clarity of the briefing process (see 2.8). For example, Barrett (2004, p.11) indicated that "briefing is not a document or an event, but rather it is ongoing process". Kelly (2004, p. 43) stated that "the construction briefing involves gathering, analyzing and synthesizing information needed in the building process in order to inform decision making and decision implementation". According to Abdul-Kadir and Price (1995, p. 388),

> "in conceptual phase, the client's needs for the constructed facility are expressed. The needs are stated in broad terms rather than in terms of specifics and the operational details of the later phases. In a project environment, the conceptual phase is at a macro level, and hence it strategically important". Thus, the design phase is an important step in the whole construction processes and operations of the CI".

Austin et al. (2002 p.250) indicated that the briefing process involves "understanding the client's needs and expressing them in a way that will ensure compatibility between the client's vision of the project and the resulting product". Furthermore, they summarized the most important problems related to construction briefing as follows: little guidance and

support for clients; designers have difficulties both in capturing clients' needs and conveying conceptual design options to them; and no common language exists between clients and designers, which impedes communication and the exchange of information between them. Added to this, Kelly (2004, p. 47) pointed out that the most common problems affecting the briefing process are the inefficient representations of the client (public projects); client changes; the absence of a design framework and standards; the client lacking knowledge, and the inability to consider hidden agendas.

The role and involvement of designers in a project briefing, as well as the form and structure of the brief, are influenced by the client's procurement strategy (Dimitrijevic, 2004, p. 26; Kelly, 2004, p. 49). Furthermore, the type of construction procurement affects the form and type of design and construction documents. Melhado et al. (1996, p.503) indicated that construction documents should contain complete and clear information about technological specifications, construction methods, production organization and quality control. They added that design is more than a drawing and description process; it includes important activities and operations associated with major actions and operations throughout the construction processes. According to Zhu et al. (2003, p.255), in today's construction industry, construction documents can be processed and presented in paper format or visual format by computer technology In this regard, the applications of computer-aided design have markedly increased the capability of designers and improved the efficiency of the whole construction process (Husin and Rafi, 2003, p. 511-512).

Currently, the literature on the CI shows that constructability, buildability and maintainability in design should be taken into consideration throughout the design, construction and operations processes. According to the Construction Industry Institute in Australia (CII, 1986), the term 'constructability' is

> "A system of achieving optimum integration of construction knowledge in the building process and balancing the various project and environmental constraints to achieve maximization of project goals and building performance" (cited in Griffith et al., 1995, p.23).

The term 'buildability' is defined by Construction Industry Research and Information Association (CIRIA) as: "The extent to which the design of a building facilities ease of construction, subject to the overall requirements for the completed building". Silva et al. (2004,p. 1243) argued that "maintainability is generally given little attention in many

developing countries. This leads to financial losses in many aspects to the client over the life of the building and inefficient use of assets". Thus, designers should consider constructability, buildability and maintainability from the briefing process to the completion of the project.

Inefficient designs will be likely to lead to delays and cost overruns and to increase disputes and claims between all parties involved in construction and the operations of the project. Kartam et al. (2001, p.235) found that defective design is one of the critical risks which caused project delays in the Kuwait construction industry.

From the above discussion, it can be said that the design phase is a cornerstone of the whole construction process and its associated activities and operations. The inability of designers to communicate and understand the client's needs and expectations may increase disputes between all parties involved in the project.

3. Estimating, Tendering and Contracting Phases

Generally, the estimating, tendering and contracting processes depend on contract documents. According to Harris et al (2001, p.121), there are three types of estimating methods: unit rate, operational rate and a combination of unit and operational methods. The first is based on calculating the direct cost of construction input resources (materials, labour, equipment, money, etc.), while the second focuses on calculating the cost of the operational time for carrying out each item of construction activities, and the third includes the cost of both construction resources and operational time. In this regard, the overhead costs of the contractor are an important factor in a project's estimates. According to Assaf et al. (2001, p. 296), in construction there are two types of overheads; the firm cost overhead and the project overhead.

The accuracy of a tender's estimates depends on several factors, including the firm's access to information sources, collection and calculation methods, techniques used in preparing the estimates, and the level and accuracy of information available. Added to these, qualified and experienced estimator/surveyors, efficient communication methods, the quality of drawings and contract documents, a firm's strategic management and resources (labour, materials, equipment) are other important factors. According to Wells (1985, p.337) the inaccuracy of cost estimates gives an indication that the contractors who have prepared them were inexperienced, which may lead to project failure and increased risk to

all parties. Thus, there is no doubt that the estimating process is an important phase in the whole construction and operation process of the project life cycle. However, inaccurate estimates are likely to restrict the operations of the CI, delay project progress and increase operational risks for all parties involved in the CI.

4. Type of Construction Contracts

Abdul-Kadir and Price (1995, p.390) stated that:

> "The contract strategy defines the relationships, duties, obligations and policies which are directed/engineered towards the desired successful total project delivery in accordance with the project planning, financial strategy, project brief, and consents and permits".

According to Loosemore et al. (2003, p.70),

> "Construction contracts are essentially written documents which seek to ensure some element of predictability and control on people's actions during the course of a construction project through the legitimate power of the courts".

Palaneeswaran et al. (2000, p.331) confirmed that "contracts are fundamental to any project, and selection of the main construction contractor is a critical and vital task". The decision to select the type of contract usually occurs in the early phases of the construction process. The selection process is affected by the legal and operating environment and the structure of the CI. However, it determines the project's overall cost, duration and the ways in which contractors will be paid, and arranges the relationships between all parties involved in the whole construction processes and operations.

Generally, there are three common types of contracts in construction: measurement contracts, lump sum contracts and cost reimbursement contracts (Burchess, 1980, p.1; Scott 1997, p. 9). The first type is based on bills of quantities. Consequently, payment to contractors is associated with completed works in accordance with project drawings and specifications. Lump sum contracts are based on the total value of a project, while cost reimbursement or cost-plus contracts are based on paying fees to cover contractors' overheads, which include the cost of materials, labour, equipment, and profit to the contractor. O'Reilly (1993, p.37) divided construction contracts into nine types in the UK construction industry. The most important of these are: build-only; design and build; design-build, operate; design, build, operate and transfer; lump sum; re-measurement; and construction management contracts.

In short, the relationships in the CI are organized and controlled by formal contracts. The three most common construction contracts are measurement, lump sum, and cost reimbursement contracts. The selection of a construction contract depends on the client's background and objectives, the general characteristics of projects, and the operating environment, construction risks and structure of the CI

2.8.2 Procurement Systems

In construction, the term procurement refers to "the process which comprises all activities required for delivering goods and services into direct ownership and/or use" (Cox et al. 1998, p.72). The procurement process "aims to acquire hardware, software, processed materials, services or combinations thereof which are necessary for the completion of the project" (Lockyer and Gordon, 1996 p. 42). Clough et al. (1991, p.3) stated that procurement is "the ordering, expediting, and delivering of key project equipment and materials, especially those that may involve long delivery periods". To Abdul-Kadir and Price (1995, p. 391). "the procurement strategy establishes the policy for the whole procurement task, and it thus ensures the availability and timely supply of resources such as materils, plant, and equipment and power. The attainment of the required standards and specifications is also an important consideration". According to Tookey et al. (2001 p.20), procurement in the CI is "a set of rationalistic decisions within a closed environment, aiming to provide generic, prescriptive rules for clients and advisers to use to select the 'best' procurement route for their project". Rowlinson (2004, p. 141) pointed out that "procurement is about the acquisition of project resources for the realization of a constructed facility". Today, clients use different types of procurement systems to deliver their construction projects. Griffith et al. (1995, p.44) classified procurement systems into four main categories: traditional contracting, design and construct or build; management-based methods (management contracting, construction management); and design and manage (consultant-based project management, contractor project management).

Furthermore, the selection of a procurement system is not an easy task, and depends on several factors. According to Cartlidge (2004, p. 4), the three most dominant factors which affect the decision about the selection of construction procurement systems are time, cost and quality. Greenwood and Walker (2004, p. 159) argued that the selection of a construction procurement system depends on a number of considerations relevant to the client and the project. They added that "a project's procurement system can have important

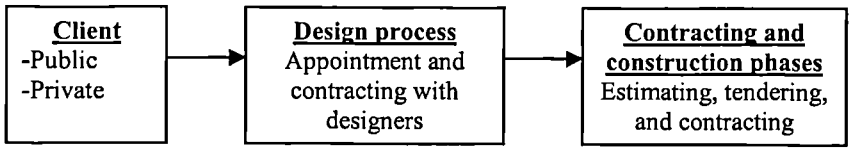
implications for its cost, gestation period and function, as well as for how the participants come together, interact, communicate and are motivated"

In short, the construction procurement system is the method by which client's needs and expectations about the project can be organized and constructed. The selection of the procurement system depends on the client's considerations, and the nature and complexity of the project. The traditional, design-build and design-build and operate procurement systems are briefly highlighted in the following sections.

1. Traditional Procurement Systems

The traditional construction process comprises three main phases. Firstly, the client appoints a designer or a consultant firm to transfer his/her needs and expectations into complete project documents. Secondly, the client invites contractors to tender for construction of the project; and thirdly, the contractors carry out the construction work in accordance with the project documents and specifications. Table 2-2 lists the key characteristics of traditional procurement systems.

Table 2-2: Traditional procurement system



Key characteristics of the traditional procurement systems (Design-Bid-Build)

1. Separation between design and construction.
2. Client takes the responsibility for design
3. Two types of sequential contracts; one for design work and the other for physical construction work.
4. Project documents prepared prior to contracting.
5. Bills of quantities are important documents for preparing prime project estimates and to calculate the future payment for contractors.
6. Contractors' estimates are crucial factor.
7. Selection of contractors is based on an intensive competitive process.
8. Clients can modify and change design during construction phase.
9. Supervision is important throughout the project cycle to oversee project performance.
10. The process takes a long time.
11. Flows of information and communication channels are of significance in this method.

Source: Compiled from Cox et al. (1998, p.75), Griffith et al. (1995, p.42-45), Clough and Sears (1991), Rwelamila et al (2000, p.45) and Greenwood and Walker (2004).

Cox et.al. (1998, p.75) argued that, in sequential contractual systems, the client is responsible for the design of the project; and the project life cycle is separated into design, tendering, contracting and construction phases. The main advantage of this method is that it allows clients to accept the risks of design, and they have more control of the design, specifications and quality of materials. However, this is time-consuming, and the scope and the value of project is subject to amendment owing to the client changing the design and specifications. Therefore, Palaneeswaran et al. (2000, p. 231) argued that, owing to the nature and complexity of today's construction projects, a reliance on traditional procurement methods is inefficient in terms of cost and time. Moreover, disputes are common between parties involved in the project. Thus, it can be said that traditional procurement systems are widely used to organize the operational processes of construction projects. A key feature of this method is the fragmentation of construction processes into the three main phases of design, tendering and contracting and construction.

2. Design-Build Procurement Method

According to Ying Ling et al (2005, p.815), the "design-construction" or "construct-build" system is a construction process in which the client contracts with a single firm (usually a D&B contractor) to undertake both design and construction of a project. Table 2.3 illustrates the key features and advantages of the design and build procurement method.

Table 2-3: Features of design and build

Client →	Design and Build phases (Architect/engineer and contractor)

The main features of design/build procurement systems
1. One organization is responsible for design and construction (turn-key project); 2. Both client and contractor take responsibility for design; 3. Operation and contractual relationships are usually based on one contract; 4. Flexible system in terms of preparing project documents; 5. Clients have more involvement in the design and construction of the project in terms of flow of information; 6. Selection of contractors is based on an intensive competition process 7. Allows more integration between participants involved in the project, as well as between design and construction; 8. Reduces project risks and enhances co-orporation between participants; 9. Compresses duration of the project, 10. Improves constructability and buildability of the project.

Source: Compiled from Turner (1995); Palaneewaram et al. (2000) and Ashworth (2002)

Turner (1995, p.15) stated that the three most basic principles for design and build procurement methods are that the project is contractually managed as a complete package, including design and construction; one contractor is responsible for design and construction; and communication channels with clients are direct during design and production phases. Crowley (1998, p.398) pointed out that in design-build procurement systems, contractors are considered as the producers of buildings and other construction. Ashworth (2002, p. 302) indicated that the integration between design and construction in design-build is probably a good long-term solution for projects and clients. However, the D&B procurement system for projects usually requires many specialist firms which have qualified design, skilled and experienced staff, operatives and workers. Palaneeswaran et al. (2000, p. 331) insisted that the design and build approach offers many advantages such as "single-point responsibility, fast-track project delivery, enhanced financial certainty, improved buildability, reduced disputes and increased productivity". Therefore, D&B is a construction procurement system in which design and construction are integrated into one process. The literature on the CI industry shows that the use of this approach has been increasing over the past decades owing to its flexibility and constructability advantages.

3. Design-Build -Operate/Transfer

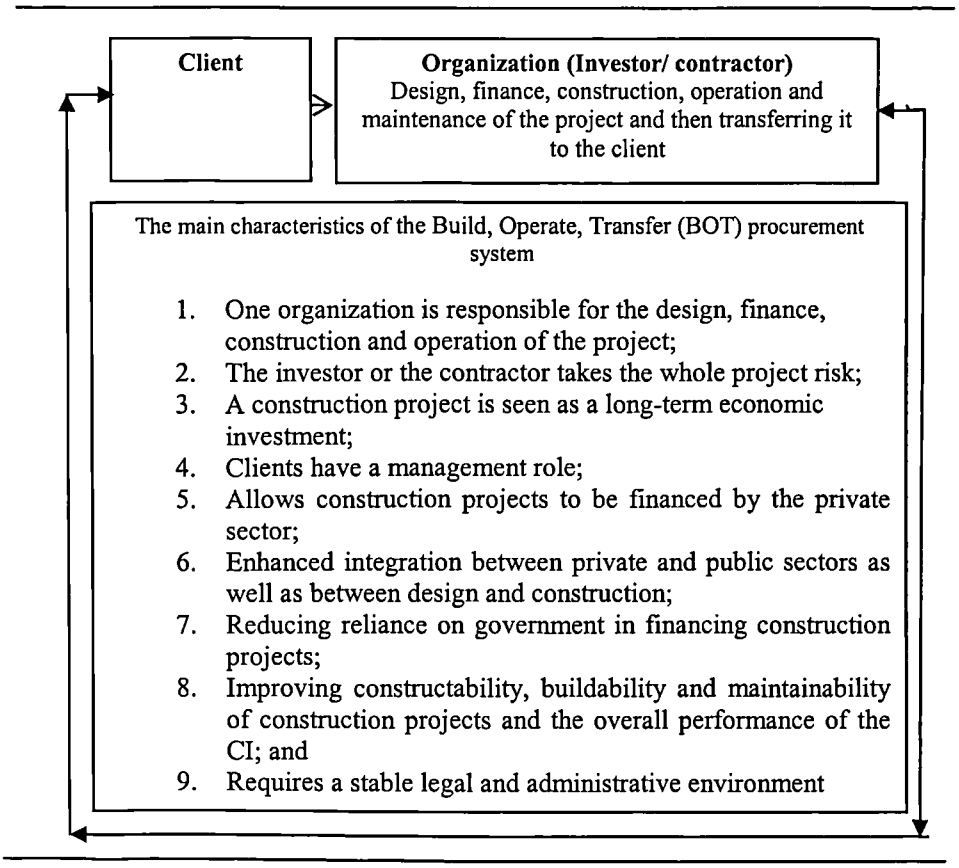
Levy (1996, p. 16-17) defined the term build, operate, transfer (BOT) or build, own, operate, transfer (BOOT) as involving:

> "The assembling of private sponsors, usually a consortium of private companies, to finance, design, build, operate and maintain some revenue-producing infrastructure project for a specific period. At the end this of concessionary period, when it has been estimated that all investment costs have been recouped from user fees and a profit turned, title to the project passes from the private consortium to the host government".

Also, he classified the design-build-operate type into: build, own, operate (BOO), build, transfer, operate (BTO), build, rent, transfer (BRT), and design, build, finance, operate (DBFO). Table 2.4 summarizes the main characteristics of build, operate, and transfer procurement systems. According to Dimitrijevic (2004, p. 26), this is a kind of construction procurement system in which "a contracting organization offers a package to provide and run a building for a number of years, and at the end of the period the ownership of the building reverts to the client".

It is clear that these procurement systems are similar to the design/build approach, but in the BOT, one organization takes responsibility for design, finance, construction, operation and maintenance of the project for a period of years. The literature on the CI reveals that these types of procurement systems are widely used in infrastructure and international projects (see 2.3.4).

Table 2-4: Features of design-construct-operate/transfer



Source: Compiled from Levey (1996)

2.8.3 Post-contracting Phase

According to Ganesan (1978, p.57), as a production process, construction is concerned with the best use of inputs to produce a desired output. Among these inputs are building materials, plant and equipment and labour and the services of design and construction agencies (see 2.6.4 and 2.7). Ive and Gruneberg (2000, p.133) indicated that "every industrial process is concerned with transforming inputs into outputs using the resources at the command of each firm. These resources are land, labour and capital and are known collectively as the factors of production".

In this phase, contractors are generally responsible for production and operations activities and associated operations (see 2.6.2). As mentioned previously, in the traditional construction procurement methods production and operation processes usually commence after the planning, design, estimating, tendering phases. In this sense, contractors are not concerned with the planning and design stages or the production of construction materials and components.

However, according to the World Bank (1988, p.20), production and its associated operations are in most developing countries restricted by contractors operating in underdeveloped operating environments which they are unable to change. Added to this, most contractors are qualified and trained through informal experience, and are unable to survive and grow owing to high construction risks. The World Bank (1988) also indicated that contractors need qualified and experienced managers who go beyond the traditional role of managers and have the managerial capabilities to cope with construction risks during the production phases. Furthermore, the literature on the CI reveals that in many developing countries production and its associated operations in building and infrastructure works are carried out by foreign contractors, owing to the low capacity and capability of local contractors (Ofori et al. 2002, p.16). As mentioned in section 2.6.4, the most important and scarce factor during production and operational processes is the management of resources and operations.

From the above, it can be said that the production phase is the core of the entire construction processes, in which construction resources and design are transformed into construction products. Construction and project management are crucial factors in the successes of the production processes and associated operations (see 2.7.5).

2.8.4 Obstacles Constraining the Industry's Processes and Operation

The review of the literature reveals that there is a consensus among researchers that there are many obstacles impeding the processes and operations of the CI in most developing countries (Ganesan, 1978; Edmondos, 1979, 1983; Bhalla et al., 1983; World Bank, 1984, 1988; Ofori, 1980, 1985, 1998, 2000c; Wells, 1986, 1999; Datta, 2000; Abdel-Razek, 1998; Jayawardane et al, 1998; Kaming et al. (1998); Kartam et al. (2000b); Eyiah et al., 2003; Selim, 1985; Lopes et al., 2002; and many others). For example, according to Ofori (1980, p.82),

> "In no country is the construction industry efficient and free from major problems".

The World Bank (1988, p.65) indicated that:

> "lack of adequate education and training, lack of government commitment, fluctuations in work-load, defective contract documents, corrupt contracting procedures, lack of protection against adverse physical conditions, delays in payments to contractors, problems of bonding and insurance, lack of adequate credit, restrictions on imports, foreign exchange constraints, unfair competition for state-owned contractors, and problems related to availability of equipment, materials and spare parts"

Ofori, (2000c) argued that:

> "The construction industry everywhere faces problems and challenges. However, in the developing countries, these difficulties and challenges are present alongside a general situation of socio-economic stress, chronic resource shortage, institutional weakness and general inability to deal with the key issues. There is also evidence that problems have become greater in extent and severity in recent years".

Given the above obstacles, the CI is a risky business (see 2.1.1). Griffith (1992, p.47) argued that "risk is always inherent in any construction project, whilst it is reasonable to suggest that the degree of risk will increase with the technical complexity, extent and cost of the work". Edwards et al. (1995, p.5) classified risks into seven types: physical or material, consequential, social, legal, political, financial, and technical risks. Twort et al (1995, p.18) pointed out that design mistakes and changes during construction, unforeseen physical conditions, unforeseen price rises in labour and materials, damage to materials or equipment on site, weather conditions including floods or extreme hot weather, delay or inability to obtain materials or equipment required, inability to get the amount or quality of labour required, and errors in pricing by the contractor, are key causes of construction risks. Baloi and Price (2003, p. 264) classified risks affecting cost performance of projects into three main types: organization-specific (internal factors), global and acts of God (external) risks.

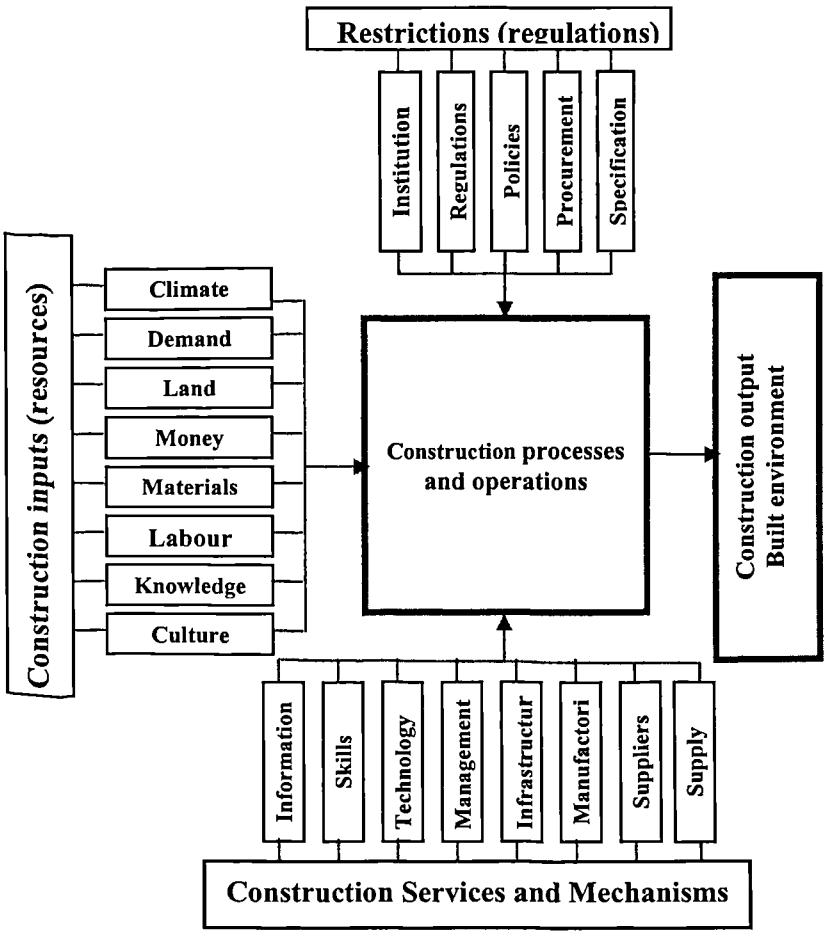
In short, in most developing countries, the CI faces many obstacles and barriers constraining its processes and operations, and which affect its overall operations, performance and efficiency. In general, these obstacles can be classified into three broad groups: those related to the industry itself, those related to its actors and operators, and

those related to its operating environment. These obstacles cause risks in the CI and restrict its associated processes and operations.

2.9 A Proposed Model for the Construction Industry

The review and discussions throughout this chapter show that a theoretical framework is an essential basis for the development of the industry, and also it is a useful tool to understand and investigate the CI. Consequently, a theoretical model for the CI is proposed below in figure 2.3. Briefly, based on the initial definition of the CI in section 2.1 in this study, the CI is seen as the processes and operations of transforming construction resources into the physical built environment by formal and informal firms and many other actors involved in the CI in accordance with geographical, social, economic and technical circumstances.

Figure 2-2: A proposal model for the construction industry



Source: compiled from World Bank (1984, 1988); Ofori, (1980, 1989); Wells (1986), Hillebrandt (1988, 2000) and many others, as well as from discussions in this chapter

As can be seen in figure 2.2, the CI is analysed into five key components or sub-systems, including: construction restrictions or regulations; construction resources or inputs; construction processes and operations; construction services and mechanisms; and finally, construction physical output or products. The overall performance and efficiency of the CI and its associated processes and operations is associated with the efficient management and integration between these components. It is believed that this model simplifies the process of exploring the CI, and helps to establish testable and operational research and to develop and design an appropriate research methodology. It also makes methodological links between the theoretical and operational contexts of the CI; creates variables and indicators by which the empirical research and its methods of data collection can be designed; sets up guidelines for the empirical research and the process of analysis; and guides the discussion and analysis in the following chapters (see chapter five).

2.10 Summary and Conclusions

This chapter has reviewed the literature on the CI and its key issues. The CI and its associated processes and operations have received a great deal of interest from the research community in both developed and developing countries over the past decades. Furthermore, two points can be made. Firstly, the vast majority of research has examined the CI from an economic perspective. Secondly, the CI in developing countries has been investigated according to theories, approaches; methodologies and techniques initiated, developed and applied in developed countries without any adaptation taking into account the geographical, political, social, technological and economic circumstance of these countries.

Sections one and two confirmed that the CI has unique characteristics and a vital role in a nation's economy and development processes. However, it is argued that unplanned operations of the CI can slow and restrict economic growth and development processes. The CI is seen as a series of processes and operations aimed at transforming construction resources in a certain geographical, political, social and economic context. Section three explored the structure of the CI, showing that the industry, in general, comprises building and civil sectors. Added to this, the formal and informal construction industries and partnering in construction were discussed. The most important issue to emerge in this section is that the informal construction industry has played an important role in the operations of the CI, particularly in developing countries.

Section four reviewed the issue of supply and demand in the CI, and section five discussed types and general characteristics of construction projects, confirming that the operations of the CI are organized around a construction project. Section six reviewed and explored firms in the CI in terms of types, sizes, roles, resources and subcontractors. The review confirmed that consultancy and construction firms are the key suppliers and actors in the CI. Two important issues emerged. Firstly, small firms have become a dominant feature in the structure of CI; and secondly, subcontractor firms have increased markedly in the CI over the past decades. Rapid economic and technological changes are considered as the key reasons behind this phenomenon. In section seven, construction resources including land, construction and building materials, manpower, construction technology and construction and project management were highlighted.

Section eight reviewed construction and operations processes and their associated phases; the review confirmed the significant role and influence of the state in the CI. Then, the construction processes were classified into two main phases: the pre-contracting phase (information and communication, design, estimating and type of contracts), and the post-contracting phase which includes production and operational activities). Added to this, the procurement systems (traditional, design-build and design-build–operate-transfer) were discussed and highlighted. Three important issues were addressed. Firstly, the revolution in information and communications technologies is likely to affect the CI in terms of the format and quality of documents and flow of information, as well as in the efficiency of communication processes. Secondly, there has been growing interest in using the design-build procurement system and partnering in construction in the CI over recent decades. Thirdly, designers should take into consideration constructability, buildability and maintainability in design and construction. Finally, the chapter has built up a model for the LCI. The most important issues to emerge were that, firstly, a theoretical background is an essential basis for the CI. Secondly, the shape of the CI and its associated processes and operations is a consequence of the interaction of geographical, social, political, institutional, economic and technological factors. Based on the outcome of this chapter, the following chapter explores the place of the study where the LCI operates. A focus is given to those external factors which influence the CI in Libya and its associated processes and operations.

Chapter Three

3 Libya: The Context of the Study

3.1 Introduction

This chapter introduces Libya as the operating environment where the construction industry operates and the research has taken place. Therefore, the main purpose of this chapter is to explore and review the key features of the context of the study and to identify the key factors that influence the operations of the Libyan construction industry (LCI). In this sense, the chapter attempts to understand the interaction between the geographical, political, social and economic circumstances of Libya and the operational aspects of the CI.

The chapter is organized into five main sections. Section one introduces the chapter and its main objectives. The second section gives a general review of the geographical characteristics of Libya, and the third section provides a brief historical background of the country. Section four highlights its political environment; section five gives a brief outline of the social environment; and section six provides a general overview of Libya's economy. Particular focus is given throughout to those aspects that affect the CI and its associated operations in Libya.

3.2 Geographical Characteristics

According to the Secretariat of the United Nations Convention to Combat Desertification (UNCCD, 2001, p15-20), the main characteristics of hot dry lands are high and extreme temperature, low and variable rainfall, desertification, drought and scarcity of water, and sand or dust-storms. Therefore, it can be said that these geographical features and their influences on the social, cultural and economic environment need to be considered when conducting any research in this region.

As mentioned previously, Libya is located geographically in the centre of the hot dry[4] region in the north of Africa. As a consequence, up to 90 per cent of Libya's total area is classified as arid and semi-arid lands, and more than ninety seven per cent of the country's water supply is obtained from underground resources (GCP, 2000a, p.11-12). Thus, it can

[4] "Dry land areas cover about 43 per cent of the world's surface. They are inhabited by about 1 billion people. More than 100 countries, many of them among the least developed, lie entirely or partly within dry lands" (UNCCD, 2001). For further information see Squires (2001, p.15-47) in UNCCD (2001).

be said that the most serious challenges for development are the proportion of desert and the scarcity of water.

Topographically, Libya has three main zones (see figure 1.1). The first zone consists of coastal lands along the Mediterranean Sea, known locally as 'Al-Sahell'. The vast majority of the population and social and economic activities are concentrated in this region. The second region comprises two ranges of mountains; these are the Western Mountains in the northwest and the Green Mountains in the northeast. The third topographical zone is the desert or Sahara lands (see figure 1-1). Libya's climate is a mixture of the climates of the Mediterranean Sea and Sahara desert. As a result, in the northern coastal and mountainous regions, the climate is characterised by a warm summer and relatively mild and short rainy winter, while the southern region and the interior desert are influenced by the Sahara's climate which is characterized by a long, hot and dry summer with very extreme temperatures, and a dry winter with warm days and very cold nights.

In the light of the above brief description, it can be said that the country is characterized by the general features of hot dry lands. Therefore, Libya has economically very limited land in terms of being suitable for life and development. These circumstances should be considered as one of the key features of Libya's geography; it is a sensitive fragile environment. It is argued that in Libya in particular, and in arid and semi-arid countries in general, the operations of the CI cannot be efficiently planned without gaining a full understanding of geographical and climatic circumstances within which the industry operates. It appears that the majority of studies of the CI have focused only on economic issues, and little attention has been given to the relationship between geographical, climatic and technological factors and the operations of the CI in these regions.

Thus, two important issues relevant to the operations of the CI can be stressed. Firstly, in the operations of the LCI water is likely to be an important construction resource. The term operations in this context refers to the processing of raw materials, manufacturing of construction materials, transportation, assembling of materials and components, curing concrete structures, washing construction equipment and utilizing and maintaining the final product; and secondly, the transportation of construction inputs is also likely to be expensive. The influence of these two factors on the processes and operations of the CI will be empirically investigated in the following chapters.

3.2.1 Four Dominant Regions

Throughout its history, the distribution of the population and human settlements in Libya have been influenced by geographical factors. In this context, Elmahmudi (1996, p.127) argued that:

> "The geographical problems, such as few sources of water and the extreme climate, were influential in pushing the people to live in difficult places in order to obtain water, especially in the desert. Most of the Libyan Islamic cities are separated from each other by a few hundred miles as on the coast, and more than this distance in the desert".

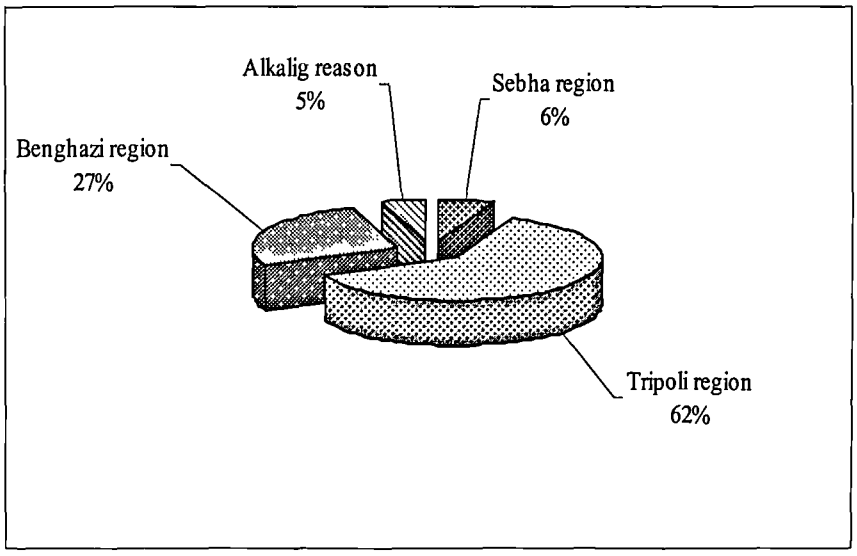
This phenomenon is still one of the key features of Libya's demography. For example, analysis of available data confirms that there are four dominant regions in Libya in terms of the concentration of the population and social and economic activities, as well as the size and scale of construction output. These are the Tripoli, Benghazi, Al-kalig and Sabhah regions. These settlements are separated by wide areas of desert lands and huge distances (see figure 3.1).

From figure 3.1, it is clear that the Tripoli region is the largest in terms of population. It is located in the north west of the country. For a variety of reasons this region is considered as the most important in the country in terms of the concentration of the population and social and economic activities. Around seventy nine per cent of the total fertile agricultural lands are concentrated in this region and it produces sixty per cent of the country's agricultural products (Rasheed, 2004, p.2). As a result, it should be no surprise that, in 2003, sixty two per cent of the total population of Libya was settled in this region. However, the area of the region is only around thirteen per cent of the total area of the country (see figure 3.2). Tripoli city, the capital of the country, is located in the centre of this region, and more than 34 per cent of Libya's population is aggregated in this city. As a consequence, the city is the largest and fastest growing city in the country.

The second region is Benghazi, located on the northeastern coast of the country. In 2003, around 26 per cent of the total Libyan population was settled here. However, the region covers only eight per cent of the total area of the country. Benghazi city is in the centre of this region; it is as the second city in Libya in terms of the size of the population. It is important to mention that the distance between Tripoli and Benghazi (the largest two cities in the country) is around one thousand kilometres; most of the areas in between are

desert and semi desert lands, particularly from Misurata to Benghazi, as can be seen in figure 1.1.

Figure 3-1: Percentage distribution of population within the four dominant regions in 2003



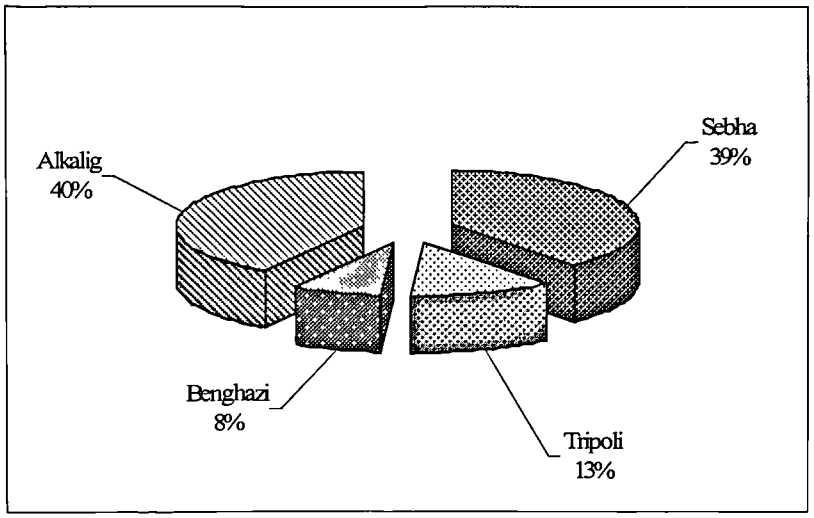
Source: Calculated from the annual reports of the General National Corporation for Information and Documentation (NCID, 2003 and 2004)

The third region is Alkaleg. This is located between the Tripoli and Benghazi regions. Only around 5 per cent of the total Libyan population are settled in this region. However, it accounts for forty per cent of the total area of the country. Moreover, a large number of oil and gas fields are located within this region. As a result, the region has experienced remarkable social and physical changes since the discovery of oil in the late 1950s, and many large complexes of the oil industry and new cities have been constructed in this region over the past decades, such as Al-Sidra, Al-Briga and Ras-Allanouf. Furthermore, in 1987, the political capital of the country was moved to the city of Surt which is located in the centre of the region (roughly halfway between Tripoli and Benghazi). As a result, this city in particular and the region in general witnessed an intensive construction boom during the 1980s and 1990s.

The fourth region is Sebhah, located in the south of the country and covering thirty per cent of the total area of the country. However, only 6 per cent of the population of the country dwell in this region. In general, the region comprises desert and treeless lands. In this sense, desert oases are the main pattern for settlements. These oases are scattered within the large dry deserts. Sabhah is the major oasis and the capital of the region. The

distance between Sabhah and Benghazi is more than one thousand kilometres, while it is more than 800 kilometres from Tripoli.

Figure 3-2: Areas of the four dominant regions



Source: General People's Committee for Utilities (1984, p.22)

From the above, the following three issues relevant to the influence of geographical factors on the operations and shape of the CI in Libya emerge, Firstly, the vast majority of settlements and economic and construction resources and activities are concentrated in the northern regions, particularly in the Tripoli region. Secondly, communication is also a crucial factor in the operation of the industry, due to the country's large area, and the fact that cities and towns are separated by long distances of desert and semi-desert; and thirdly, Libya's harsh climate might restrict construction operations such as concrete work. Thus, it is clear that geographical dispersion is one of the key characteristics of Libya's lands. According to Qygard et al (1999, p.1-2), the main feature of such a geography is isolation from major population areas and markets, and poor access to services, technology and markets. In addition, the transportation costs of inputs and outputs are high and inefficient and communications systems are poor. Thus, it can be said that geographical characteristics are probably some of the key factors which have affected the current shape and operations of the LCI. These issues and their impact on the operations of the LCI will be empirically discussed in the following chapters.

3.3 Historical Background

According to Gruneberg et al. (2000, p.180), "the organization of the industry itself is a consequence of historical, legal and financial development". Furthermore, there is view which argues that:

> "Some problems facing the CI have deep roots in history, culture or economic circumstances and are clearly beyond the scope of the industry alone to solve" (ILO, 2001, p.45).

Given that the contemporary construction industry in Libya is linked to a large extent with the country's social, political and economic history, it is essential to provide a brief overview of Libya's history. Libya has experienced momentous historical events since the beginning of the twentieth century. These events can be summarized as follows:

1. The occupation of Libya by Italy in 1911. The influence of the Italians on the CI in Libya is discussed in chapters there and four;
2. The establishment of a national state in 1951. The effect of the establishment of the national state on the CI is discussed in section 4.4.2;
3. The discovery of oil in 1957. The impact of oil on Libya's economy and construction are reviewed and discussed in chapters three and four;
4. The revolution in 1969. The construction industry in this era is explored and discussed in sections 3.4.3 and 4.4.3;
5. The declaration of the state of the masses in 1977 and the implementation of socialist principles in 1978. More details about the influence of the implementation of socialist laws are discussed in chapters four and six;
6. The collapse of oil prices at the beginning of the 1980s, and its impact on the CI are highlighted in sections 3.6.3 and 4.4.3;
7. The American and United Nations sanctions against Libya between 1982 and 2003. The influence of the sanctions on the economy and construction are discussed in section 3.6.3; and
8. The structural readjustments made to Libya's economy since the second half of the 1980s. These are discussed in chapter four.

It is beyond the scope of this study to discuss in detail the impact of the above historical events on Libya's social and economic context. However, the influence of each event on the LCI itself and its operating environment are identified and discussed when reviewing and exploring the development and organization of the LCI in chapter four, and when reporting on the findings of the empirical research in the subsequent chapters.

3.4 Political Environment

This section briefly outlines the political environment of Libya, including the political system, and the role and structure of the state. Then, three key political issues in connection to the CI and its associated operations are highlighted.

3.4.1 The Political System

According to Joffe et al. (1982, p.xii),

> "There are few places in the Middle East and North Africa that suffer so badly as Libya from a dearth of academic literature concerning social, political and economic changes".

Furthermore, Chackerian (1977, p.114) argued that, "the changes that have occurred in Libyan government and administration since the 1969 revolution have been truly remarkable". Since 1978, the political system has been based on the principles of the ideology of the Green Book. This is organized around a political theory known as 'The Third International Theory'. According to this theory the state is known in Arabic as 'Jamahiriyah' In the Jamahiriyah state, Libyan society is divided geographically into hundreds of Basic People's Committees (BPCs) and Local People's Congresses (LPCs). All Libyans over 18 years old should attend meetings of the BPCs. Furthermore, they should state their views, opinions and decisions about political, social and economic affairs at both local and national levels. According to Ayoub (1986, p. 39), this complex political system allows each member of society to participate in the process of decision making. However, from experience, in reality tribalism still guides and controls social and political life in Libya.

Currently the state comprises three key authorities; the political, planning and executive authorities. At the national level the General People's Congress (GPC) (equivalent to parliament in western systems) is the highest political authority in the country. It is responsible for all state political issues and affairs. For example, the General People's Committee (GPC) (Council of Ministers) is selected and appointed by the GPCO. In addition, all state legalisation is issued by this authority. Table 3.1 explains and summarizes the structure of the political system in Libya and the role of the state.

Table 3-1: The structure of the political system in Libya and the role of the state

	Structure of state	Role	Responsibility
Governance	General People's Congress	- Approves state strategies, policies, and budgets.	- Determines and approves the state administrative and development budget. - Organizes the state structure - Issues laws
Planning	General Planning Council (National planning)	- Studies, suggests and evaluates national strategies and policies.	- Suggests social and economic development policies. - Approves and decides the value of construction projects.
Executive bodies	General People's Committee (Ministries Council)	- Implements social and economic policies, and plans.	-Generates and controls construction demand and supply. - Organizes the construction industry - Supervises the public sector.
	People's Committees in Shabias (Local authorities)	- Implements local social and economic policies and projects.	- Generates local construction demand - Distributes local construction projects - Organizes local industries - Supervises local construction industry
Planning	Planning Council in Shabias (Local planning)	- Studies, suggests and evaluates local policies and projects.	- Suggests local social and economic development plans. - Determines the priorities of construction projects

Source: Compiled from the General People's Congress (1977) and the NCID (1999).

The executive authorities comprise two levels of institutions: national and local government. The first is known as the General People's Committee (GPC) (Council of Ministers). The GPC is responsible for the management, supervision and implementation of national social and economic policies and development plans. The second executive level is local government; this is responsible for the management, implementation and supervision of social and economic development plans and projects at local levels in the Shabiat or municipalities (see table 3.1). The third body of the Libyan state is the planning authority. This is the General Council for Planning (GCP), which is considered as the highest national planning authority in the country. It is responsible for conducting national planning studies and the assessment and approval of national social and economic strategies and budgets. Subsequently, local Councils for Planning were established in the municipalities (Shabiat). These are responsible for carrying out local studies and approving local social and economic projects and budgets.

In the light of the above brief outline it becomes clear that one of the key features of the political system in Libya is that it is based theoretically on a classless society and the enablement of all members of society to state their views, opinions and decisions regarding their political, social, and economic affairs. However, the process of decision making is fragmented between political, planning and executive authorities. The impact of this fragmentation on the CI and its operations will be discussed in more detail in chapter four, and empirically investigated in the following chapters.

3.4.2 Role of the State

Following on from the above, it is clear that since Libya attained its political independence in 1951[5], the state has played a dominant central role in political, social and economic affairs (Government of Libya, 1969; GCP, 2000b, p. 23). However, the role of the state has seen two main phases: firstly, it had a highly centralized role between 1970 and 2000 in which the central government was dominant in managing and controlling the economy and social and economic development plans; and secondly since 2000, decentralization was adopted to manage social and economic development plans. Consequently, sectors such as education, heath, housing and utilities, agriculture, transportation and communication, and construction, and many other central public companies and national corporations have been abolished and their responsibilities transferred to the local authorities (Shabiat) or municipalities. In brief, at the time of this study, local authorities have a vital role in administrative affairs and social and economic development plans. The influence of the state on the operations of the CI in Libya is discussed in chapter four and empirically investigated in chapters six, seven and eight.

3.4.3 Key Political Issues Relevant to the Construction Industry

The application of the principles of socialist laws in 1978 and the impact of international sanctions against Libya between 1983 and 2003 are considered as the two most important political issues affecting the CI in Libya in terms of its role, structure, organization, operations and management. The following sections briefly discuss their influences.

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[5] Since 1951, the country has experienced two political regimes; the first was the monarchical regime between 1952 and 1969, and the second is the revolutionary regime since 1969. As a result, the official name of the country changed three times The first name was 'the Kingdom of Libya' between 1951 and 1969; the second was 'The Libyan Arabic Republic' between 1969 and 1977; and the third is 'The Socialist People's Libyan Arab Great Jamahiriya' since 1977. The term 'Jamahiriya' is an Arabic word referring to the authority of the people.

1. The Application of the Socialist Laws

According to the declaration of the state of the masses[6] in 1977 (GPCO, 1977), the principles of a socialist system were adopted as the basis of the political system in Libya. Therefore, by 1978, the ideas and principles of the Green Book[7] Part Two were implemented. As a consequence, the Libyan economy was reorganized to meet the objectives of socialism. In what follows, the impact of the implementation of the socialist system on the social and economic environment, with a particular focus on its impact on the operations of the CI and its working environment, is briefly described.

2. Workers as Partners

One of the main principles of the Libyan revolution is 'socialism'. Therefore, Al-Qadhdhafi (1978, p.43-69) argued that employers and contractors exploit the workers when they hire them to carry out production activities for any kind of products and services. He added that in such work circumstances, workers receive certain and limited wages, and as a consequence they are not motivated to increase their productivity. He concluded his arguments by stating that "Wage workers are a type of slave" and workers must be "partners not wage workers". In this sense, every partner involved in any production and its associated operations and processes, such as workers, professionals, administrators and many others, must be basic partners in the firms, factories and organizations in which they work. Furthermore, they must have equal rights to share in management. In addition, firms' or organizations' profits must be divided equally among all workers (partners) according to their efforts in the production and operations processes.

In the light of the above circumstances, a major transformation in the system of the ownership structure of the construction sector occurred in 1978, when the government and the public sector took the responsibility for all economic sectors. As a consequence, between 1978 and 1989, the state passed a set of laws and decisions aimed at encouraging and enabling workers to be partners in production, and at reorganizing the economic environment according to the principles of the partnership system (General People's

[6] On 2 March 1977, the General People's Congress (GPCO) declared the state of the masses, in which "the authority is in the hands of the people alone. The people exercise their authority through the people's congress, the people's committees and professional unions. The regulations of the congresses, committees, and professional unions as well as the dates of their meetings are defined by law" (GPCO, 1977, p.1).

[7] Al-Qadhdhafi's philosophy concerning the organization of political, social and economic life is introduced in three parts of his Green Book published between 1977 and 1978. Part One, *'The Solution of the Problem of Democracy'*, deals with political issues; part two, *'The Solution of Economic Problems'*, is concerned with economic aspects and part three, *'The Solution of Social Problems'* is devoted to social organization. For further information see Al-Qadhdhafi (1978).

Committee of Planning, 1985, p. 6). Consequently, construction business shifted from entrepreneurship to a public partnership system. This was a remarkable turning point in the organization of the CI in Libya.

By 1980, according to Law no. 343 of 1977 (government of Libya, 1977), contracting in the construction sector was limited to only public and international companies. Moreover, the General People's Committee and Ministry of Housing issued a series of laws and regulations with the aim of abolishing private construction companies, (Ministry of Housing, 1982). In such an environment, any business in the Libyan market at that time was organized around the public sector in terms of ownership and management. As a consequence, private and state-owned public companies in all economic sectors, as well as small factories, were reorganized in order to meet the principles of the partnership system. In short, the implementation of the principles of the socialist laws affected the role, scope and organization of the LCI and its associated processes and operations. As a result, the CI adopted the partnership and cooperative system as the main legal framework to form and run firms. The influences of this system on the organization, structure and operations of the CI are discussed in chapter four and empirically investigated in chapters six, seven and eight.

3. Rights to Housing and Ownership

In the Green Book, close attention is given to the rights of housing and ownership. Al-Qadhdhafi (1978, p 53-54.) argued that "the house is a basic need of both the individual and the family". Furthermore, he added:

> "No one has the right to build a house, additional to his own and that of his heirs, for the purpose of renting it, because the house represents another person's need, and building it for the purpose of rent is an attempt to have control over the need of that man and 'In Need Freedom is Latent".

Moreover, he confirmed that "The legitimate purpose of the individual's economic activity is solely to satisfy his (material) needs" (Al-Qadhdhafi, 1978, p.56). From these above statements, two important issues relevant to the housing construction industry can be raised. Firstly, according to the property ownership law No. 4 of 1978 concerning the proprietorship of real estate (articles 1 and 2), any Libyan citizen has the right to build and own only one house (Ministry of Housing, 1985, p.416-431). As a result, private investment in housing production for selling and renting was prevented.

Secondly, the traditional rent control system in housing was considered as a kind of exploitation and control of the basic needs of other persons. Consequently, since 1978, the rental of houses for Libyan citizens has been forbidden. Moreover, law No. 4 of 1984 gave renters the rights and support to become owners of the houses which they rented (Government of Libya, 1984). It is obvious that the application of the above regulations has affected private investment in housing and the operations of the housing construction industry in terms of housing production. However, on the other hand, renters were protected. The impact of these regulations on the CI's operations is discussed in appendix B and empirically investigated in the following chapters.

4. Trade and the Distribution of Goods

The organization of trade and distribution of goods experienced intensive changes in Libya between 1978 and 1990, owing to the application of the socialist system. As a result, by 1979, the private trade sector was abolished, and was prevented from playing its traditional role in trade and the supply of goods and services. As a consequence, between 1978 and 1985 hundreds of state-owned supermarkets[8] were constructed in all towns and cities of the country in order to distribute goods and services (MP, 1980, p.55). However, by 1988 it became clear that public trade markets had failed to supply goods and services efficiently or to improve the economy. As a consequence, according to decisions No. 48 and 422 of 1989, the state allowed the domestic and private sectors to run business in trade and the distribution of goods and services (Government of Libya, 1989). Therefore, nowadays, local private shops and small trade firms dominate the market.

From the above summary, it is clear that trade activities were regulated according to the political principles of a socialist-oriented economy. Unstable markets in terms of availability, inefficient distribution and irregular supply of goods, together with unstable prices, were the main characteristics of the trade market during that period. However, since the beginning of the 1990s, the domestic and private trade sector have been playing a key role in trade and the distribution of goods and services. The issue of supply systems in the LCI are empirically investigated in chapters six and seven.

[8] These markets were constructed using steel structures by foreign companies between 1978 and 1984 in all regions of the country. Nowadays, all these markets are suffering from damage and lack of regular repair and maintenance.

5. International Sanctions against Libya

Libya experienced a series of economic and political sanctions in the 1980s and 1990s. However, the most influential sanctions were imposed by the United Nations according to UN Resolution No. 748 of 1992. These sanctions extended from 1992 to 2003 and were lifted by the UN Security Council's resolution No. 150 of 2003. The implementation of sanctions had a tremendous impact not only on the economy but also on the culture and attitudes of Libyans. For example, Tarbagaia (1995, p.190) concluded that Libya's industry, including the CI, as well as the overall performance of Libya's economy, suffered from the United Nations embargo. As a result, serious damage and major financial losses were caused by the sanctions between 1992 and 2003. For instance, the annual rate of growth of GDP declined from 6.9 per cent in 1990 to only 0.5 per cent in 1997. On the other hand, the rate of inflation increased sharply from 4.7 per cent during the period 1985-1990 to 14 per cent in 1997 (GCP, 2000a, p.19). In addition, during the sanctions period the value of the Libyan Dinar against foreign currencies declined dramatically. Added to this, the prices of goods and services increased, and many goods were sold on the black market. The impact of sanctions on the CI and its operating environment will be discussed in detail in chapter four.

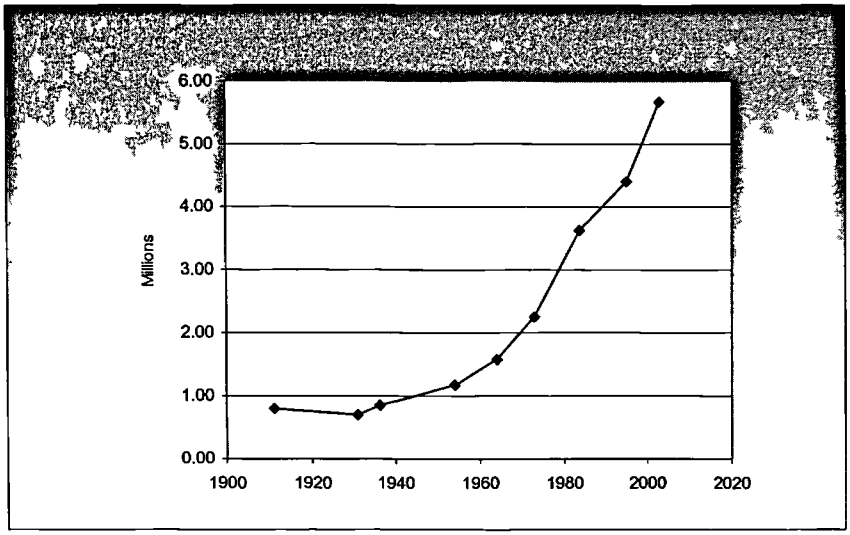
3.5 Social Characteristics

This section gives an overview of the social environment in which the LCI operates, discussing demographics, social organization, tribalism and urbanization.

3.5.1 Demographic Characteristics

According Muya et al. (2006), "the wealth of any nation is ultimately based on its human resource or social capital. Education and training are the primary vehicles of developing this resource". At the time of independence in 1951, Libya had a population of 1,182,000 (see figure 3.3). However, in 2004, the population of Libya was estimated of about 6 million inhabitants. It is expected that by the year 2010, this will rise to around eight million (NCID, 2003).

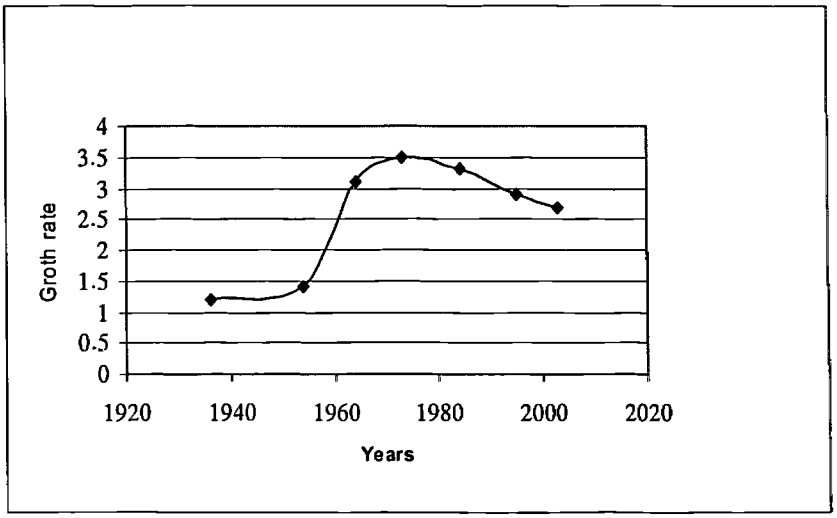
Figure 3-3: Development of the population of Libya from 1911 to 2003



Source: Compiled and calculated from the 1954, 1964, 1975, 1984 and 1995 Population Censuses and the Reports of the National Corporation of Documentation and Information (NCID) (1998, 2003), Tripoli, Libya.

More than eighty-eight per cent of the population are concentrated in the northern coastal regions, and eighty per cent are settled in urban areas (www.unhabitat.org, 2005). Around nineteen per cent of the total population is illiterate (Shuman, 2004, p.3). These figures indicate that Libya is a small country in terms of population. However, the majority of the population dwell in urban areas and are educated.

Figure 3-4: The annual growth of the population in Libya between 1936 and 2003

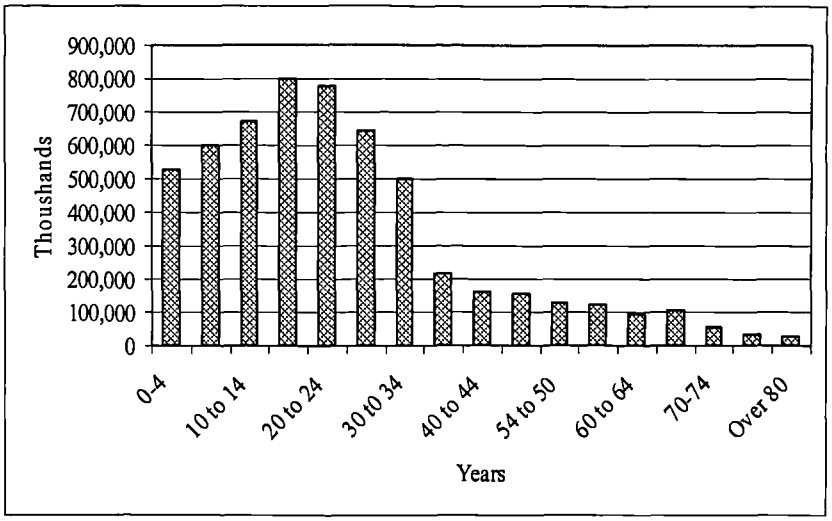


Source: Compiled and calculated from 1954, 1964, 1975, 1984 and 1995 Population Censuses and the Reports of the National Corporation of Documentation and Information (NCID) (1998, 2003), Tripoli, Libya.

However, secondary analysis of the demographic data shows that the annual population growth rate has declined in Libya over the last two decades. As can be seen from figure 3.4 it increased from 1.4 per cent in 1954 to 3.1 per cent in 1964 and to 3.5 per cent in 1973. However, in 1995 and 2003, it had fallen to 2.9 and 2.6 per cent respectively (MP, 1996, p. 23; NCID, 2004). This may be attributed to social and economic reasons.

Furthermore, the age structure of the Libyan population has changed over the past three decades. Currently, the vast majority of the population are young persons (see figure 3.5 and 3.6).

Figure 3-5: Age structure of the Libyan population in 2003.

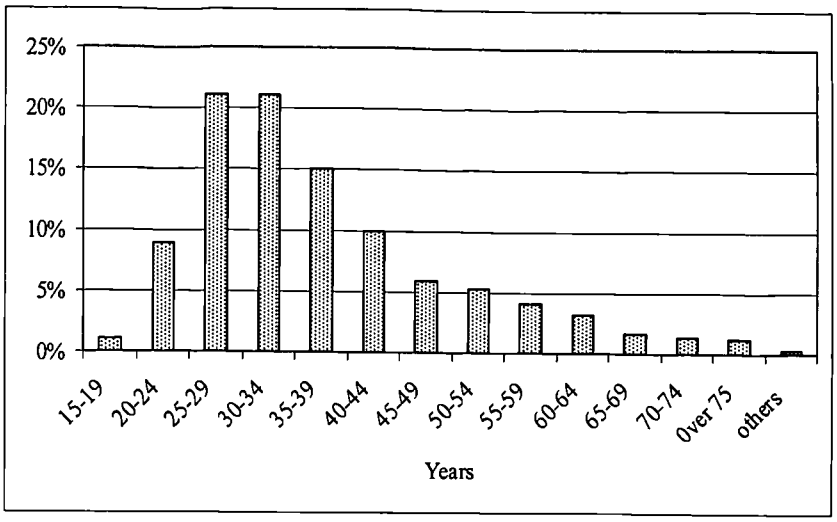


Source: Complied and calculated from the Report of the National Corporation of Documentation (NCID) (2003), Tripoli, Libya.

In 1995, more than fifty-five per cent of the population in Libya were between 15-64 years old (see figures 3.5 and 3.6). In addition, 41.5 per cent of the whole population were less than 15 years old (General People's Committee for Planning, 1995). These indicators suggest that Libya has limited human resources. As a consequence, the size of the non-national population in Libya has increased rapidly in the past three decades.

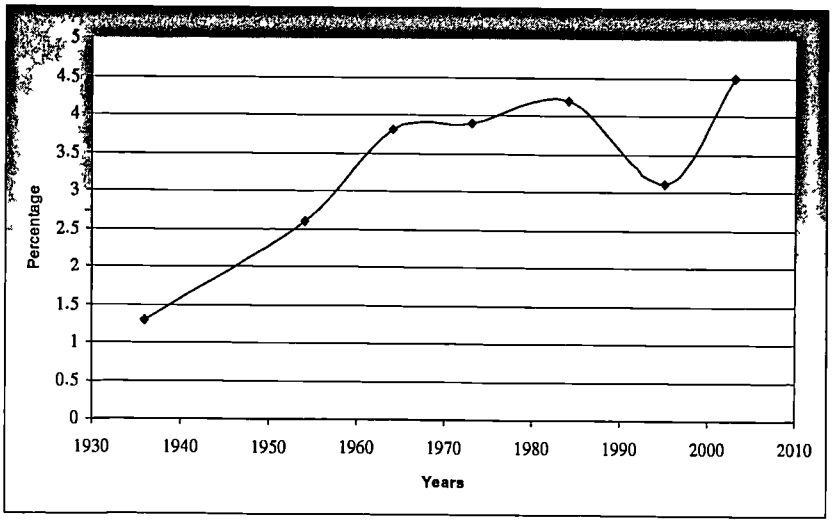
The proportion of foreign nationals in the population increased from around 4 per cent in 1964 to 8 per cent in 1973 and then to 19.6 per cent in 1983. However, in 2003, according to government estimates, it had reached around 44.6 per cent of the national population (GCP, 2002, P. 43). This increase can be attributed, in general, to the small human resources of the country and the intensive demand for foreign workforces as a consequence of intensive development plans, particularly in the 1970s and 1980s.

Figure 3-6: Age structure of Libyan manpower in 2001



Source: Complied and calculated from: the National Corporation of Documentation and information (NCID) (2002).

Figure 3-7: The growth of the non-national population between 1936 and 2003



Source: Compiled and calculated from the 1954, 1964, 1973, 1984 and 1995 population censuses, the Reports of the National Corporation of Documentation and Information (NCID) (2001, 2002), Ministry of Planning (1980) and the Reports of the General Council for Planning (GCP) (1999, 2002, 2003), Tripoli, Libya.

To conclude this section, it can be said that over the past decades the demographic context of Libya has changed rapidly in terms of size, age structure, the annual growth of the population and the number of non-Libyans in the country. Furthermore, it is evident that one of the key features of the demographic context in Libya is that the vast majority of the population are young persons. In addition, the overwhelming majority of the population

is urbanized. Also the non-national population comprises a significant proportion of the total population in the country. These features indicate that the following points can be considered significant for the CI and its associated activities and operations in Libya.

1. Libya has few human resources and a small workforce.
2. More demand for the construction of new buildings and infrastructure products will put more pressure upon the domestic construction industry in the near future owing to the structure of Libya's population.
3. A large proportion of future demand for construction in Libya will be in urban areas,
4. The foreign workforce is an important factor in Libya's economy in general and in particular in the CI and its related activities. Thus, the current shape and future operations of the LCI are likely to be shaped, in part, by the demographic context. However, the current age structure of the Libyan population gives the opportunity to train youths in construction. These issues and their impact on the operations of the LCI will be empirically investigated in the following chapters.

3.5.2 Social Organization and Tribalism:

There is a view which argues that the CI is a microcosm of the social and economic environment. According to Ofori (1980, p.22), the "construction industry could not be isolated from the existing socio-economic, cultural and historical environment". Hebert (1981, p.3) goes further and argues that "the construction industry usually reflects a true picture of the demographic and economic situation of a country or a region". Ball (1988, p. 32) states that the economic and social organization of the CI influences the development of any country. Thus, there is a strong relationship between the social environment and overall performance of the CI. This section attempts briefly to review and discuss the general characteristics of the social environment in Libya, and addresses those issues relevant to the CI and its associated processes and operations.

According to El Fathaly et al. (1977, p.9), "The basic units of Libyan society are the extended family, the clan, the tribe, and the village, with some modification of these arrangements in urban centres". Ayoub (1987, p.28) described Libyan society as one which is closely organized around kinship and tribes. Therefore, in Libya, a tribe is an important social unit. It is known in Arabic as 'Al Qabilah'. This term refers to a social unit which is based on a blood relationship. What concerns this study in this context is the influence of tribal and social organization on decisions, behaviours, nepotism and attitudes relevant to

the activities of the CI in terms of the ownership of land, contracting and the distribution of construction output.

In the light of the above circumstances, two issues can be addressed; firstly, tribalism and tribal loyalties, and secondly, the tribal land system. In this regard, El Fathaly et al. (1977, p. 50) argued that, in Libya's tribal society, "loyalty to the state, if awareness of the state exists at all, is minimal". Therefore, the attitudes and behaviours of individuals and groups reflect to a large extent a strong loyalty to their tribes. In many cases, loyalty to the tribe's interests and affairs comes before loyalty to the state or place of work. Therefore, to date, tribal loyalty has strongly affected civil society and its institutions in Libya. For example, from the past experience of the current researcher, the tribal land system restricts construction of public construction projects (see 6.4.3). Thus, it can be said that tribalism and its associated relationships are important factors in Libya's context. Therefore, Libya's construction environment is likely to be affected by social and tribal pressures. Thus, tribalism is likely to be one of the key factors which forms the shape of the LCI and its associated operations. This issue should be taken into account when dealing with the CI and its related activities in Libya. It is empirically investigated and discussed in the following chapters.

3.5.3 Urbanization

According to Berry (1973, p.74-),

> "In the west, urbanization involved gradual and interdependent economic and social change spanning more than a century. Contemporary third world urbanization involves greater numbers of people than it did in the west. Migration is greater in volume, and more rapid. Industrialization lags far behind the rate of urbanization"

Li et al. (2005, p.323) indicated that "urban development directly leads to the increase of construction and demolition waste". As mentioned previously, more than eighty per cent of the total population in Libya are classified as urbanized. According to previous studies, the urban proportion of the total population in Libya has increased from 24.8 per cent in 1951, and to 45 per cent in 1970, to 69 per cent in 1980. In 2003, it reached more than 88 per cent (World Bank, 1960, p. 28; NCID, 2003). As a result, Kezeiri (1982, p.355) argued that "Libya is one of the most urbanized of the developing countries". Al-Farrisee (2004, p. 6) pointed out that the level of urbanization in Libya is one of the highest in the Arabic countries. The major reasons behind the rapid

urbanization are attributed, in general, to political, social and economic reasons. However, Elshukri (2000, p.103) argued that the concentration of administrative departments and services in the major cities such as Tripoli and Benghazi has resulted in the problem of over-urbanization.

As a consequence of the impact of the intensive urbanization process, particularly in the 1960s, 1970s and 1980s, Libya has witnessed a sharp increase in demand for new buildings and infrastructure projects, particularly in major cities. In addition, crucial changes have occurred in construction processes and operations and the physical built environment (see 4.3.1, 4.3.2 and 4.3.3). This indicates that the CI has played an important role in the urbanization process in the country over the past decades. For instance, there are many recorded examples in Libya in which housing projects and the establishment of new towns and cities (such as the new planned cities and towns that were constructed in the 1970s) were used to attract rural people to become urbanized.

In short, urbanisation is one of the most significant social and physical changes in Libya. Furthermore, two issues in connection to the nature and operations of the CI activities can be made. Firstly, a vast majority of construction activities have been concentrated in urban areas; and secondly, major cities such as Tripoli and Benghazi and others are likely to witness intensive construction activities in the coming decades. The impact of these issues on the LCI is discussed in the following chapters.

3.5.4 Key Social Issues Relevant to the Construction Industry

In the on-going development process in Libya, urban housing is one of the most important social and economic issues relevant to the CI and its associated activities and operations. Therefore, this section attempts to briefly outline this issue and to address its impact on and relation to the operations and role of the CI. More details about the role and influence of the CI in housing supply can be found in appendix B *'The Construction Industry and Housing Supply in Libya'*.

1. Housing and Construction in Libya

Housing is an important issue in social and economic development plans in Libya, as in most developing countries. Therefore, it has occupied an important place in the state's development strategies and construction policies since the country attained its political independence in 1951. For instance, more than seventy seven per cent of the physical built

environment in Libya has been classed as residential buildings (NCID, 1995, p. 16). It can be inferred that a significant proportion of construction demand and supply relates to housing and its associated activities (see 3.5.1 and 3.5.3). The literature on housing shows that there is an interesting relationship between housing conditions and the state of the CI. According to the World Bank (1993, p. 14),

> "Housing supply is affected by the availability of resources such as residential land, infrastructure, and construction materials. It is also affected by the organization of the construction industry, the availability of skilled and productive construction labour, and the degree of dependence on imports".

It can thus be understood that, in any study concerned with the CI, the issue of housing cannot be neglected. This section briefly provides an overview of housing conditions in Libya, with a particular focus on their association with the operations of the CI (for more details see appendix B).

E. Housing Need and Demand

In the past two decades, the issues of national housing need and housing shortages have received close attention from policy makers, planners and researchers in Libya. Several government departments and organizations have conducted studies in order to estimate future needs for housing units and to determine the scale of housing shortages (Ministry of Housing, 1991; Ministry of Planning, 1996; General Corporation for Housing, 1999; General People's Committee, 2002; General Council for Planning, 2002b; Secretariat of Services Affairs, 2002; and many others). All previous studies have concluded that the housing shortage increased sharply during the 1980s and 1990s, and that the state should take urgent action to alleviate the social, cultural and economic impacts of this problem.

For example, two studies conducted since 2000 have confirmed that there is a serious housing crisis. The second study calculated that the housing shortage was around 165,000 dwelling units, and that national housing need would be around 492,000 dwelling units between 2002 and 2011. In addition, it suggested that, to clear the housing backlog and meet housing needs over ten years, it would be necessary to construct 49,000 units per year. Furthermore, the study estimated that around one per cent of the existing housing stock in 1981 (i.e., around 4100 dwelling units) required maintenance (Secretariat of Services Affairs, 2002, p. 16). In 2000, the study of the General People's Committee estimated that 97.8 per cent of demand for housing would be for new units in order to

absorb the housing backlog and to meet the demands of population growth, and 2.2 per cent of demand would be for the replacement of the existing housing stock. In addition, more than 81 per cent of demand for housing would be in urban areas, with the rest in rural and agricultural areas (General People's Committee, 2000a, p.30-31).

In the light of the above considerations, the demand for new housing units and maintenance work in the housing sector will increase in coming years. This indicates that intensive demand for construction will face the CI in Libya in the future. However, it seems that the numbers of houses needing to be produced will never be constructed owing, in part, to the financial constraints and the low capability and capacity of the LCI. These issues are empirically examined and discussed in the following chapters.

3.6 Economic Characteristics

English (2000) indicates that "The CI is a microcosm of a country's socio economic development". This section provides an overview of Libya's economic environment. Its main objective is to understand the general economic characteristics and factors which influence the CI and its operations, addressing some of the key economic issues relevant to the CI such as the public sector, inflation, the exchange rate of the Libyan Dinar, the workforce, unemployment and development planning in Libya between 1950 and 2004.

3.6.1 An Overview of Libya's Economy

A review of the literature on planning and the economy aspects in Libya reveals that the economy has experienced six historical phases over the past decades as follows:

1. The first phase was between 1951 and 1962 in which Libya was classified as one of the world's poorest countries and its economy relied on a narrow range of primitive agriculture and international financial assistance (Higgins, 1957, p.26; World Bank, 1960, p.3-4; Ghanem, p.141).
2. Between 1963 and 1969 the economy was transformed from a primitive economy into an oil-based economy. Since then it can be said that the Libyan society has moved from being a primitive agricultural society to a hydrocarbon society. In addition, the economy moved from capital deficits to capital surpluses (El-Mallakh, 1969, p. 308; Davis, 1987, p. 262).
3. Between 1970 and 1983, Libya experienced an economic boom owing to the dramatic increase in oil prices in the 1970s. As a result the national gross domestic product and

annual personal income levels increased and standards of living improved rapidly (Mahmud, 1997; Fayad, 2000, p. 15). Moreover, the process of social and economic development accelerated. Furthermore, this period saw the nationalization of Libya's economy, the application of the principles of socialism in 1978 and the expansion of the public sector (Abbas, 1997, p.112).

4. Between 1984 and 1999, the Libyan economy witnessed a period of drastic recession as a result of the dramatic slump in oil prices (with a 50% drop in oil revenues since the mid-1980s) (www.newnations.com, 2005; Fayad, 2000 p. 26), the impact of the United Nations sanctions and the poor management of the public sector.

5. Since 1988, the Libyan economy has undergone a process of structural adjustment aiming at liberalising markets, privatizing the public sector and encouraging the private sector to participate in economic and development efforts.

6. Between 2000 and 2004, after the United Nations sanctions were lifted in 1999 and increases in oil prices, the Libyan economy has been improving rapidly. In addition, an open door policy has been adopted to reform and reorganize the economy.

From the above brief outline two important points should be taken into account:

1. The Libyan economy is an oil-based economy. As a result, the most important factor which determines its overall performance is the production of oil and its prices, which are subject to disturbances and shocks. Owing to these fluctuations the state's decisions to invest in social and economic development have also fluctuated throughout recent decades.

2. Since the mid-1970s, Libya's economy has been organized around socialist principles and the public sector. Recently, the economy has been reorganized according to the rules of the free market.

Consequently, it can be said that fluctuation and instability have been the most important features of the Libyan economy over the past three decades. For example, the annual growth rate of GDP was 6.7 per cent in 1996, minus 10.5 per cent in 1998 and 3.3 per cent in 2002 (GCP, 2003, p.5). The growth rate averaged 5.3 per cent per year during the period 1973-1975; however, from 1975 to 1980, it declined to only 1.1 per cent; and between 1985 and 1990 GPD growth averaged minus 6.2 per cent. This dramatic decline can be attributed to the slump in oil prices in the 1980s and the impact of sanctions against Libya between 1982 and 2003. In 2002, Libya's GDP was LD 14,313.9 million (US Dollar

= 1.40 LD) and the GDP per capita was around US $7.750. In 2003, GDP was LD 19,131,000 millions (www.newnations.com, 2005).

According to the General Council for Planning (2000a, p.34), Libya's economy is classified into six main sectors:

1. Commodity and production sector (agriculture, manufacturing, mining and quarrying, and oil and natural gas).
2. Infrastructure or service sector (construction, electricity, water and gas, transportation, storage, and communications). The CI is viewed as part of the infrastructure service sector.
3. Production services sector (trade, restaurants and hotels)
4. Social services sector.
5. Public services (public administration, educational services, and health services).
6. Other services.

From the above, Libya's economy can be classified as a centrally planned economy, relying completely on oil and its related industries. Owing to fluctuations in oil prices, sanctions and the dominance of the public sector, the overall performance of Libya's economy experienced a period of deep stagnation between 1983 and 1999. The impact of oil and other economic variables on the CI and its operations in Libya is empirically investigated and discussed in the following chapters of this thesis. In the following section, some key economic issues relevant to the CI are briefly highlighted.

3.6.2 Key Economic Issues Relevant to the Construction Industry:

The public sector, inflation, the exchange rate of the Libyan Dinar, and development planning in Libya between 1950 and 2003 are briefly discussed in this section. This enables the current state of Libya's economic environment and its influence on the operations of the CI to be understood.

1. The Public Sector and Privatization in Libya's Economy:

According to the Central Bank of Libya (CBL) (2002, p.3), the public sector has played a dominant role in Libya since 1973. Social and economic development plans and productive and service activities have been organized and managed by, and have relied heavily on, the public sector. According to the Ministry of Planning (2001, p.40), eighty six per cent of the total investment in the development plans in Libya between 1975 and

1999 were performed by the public sector. Only 10 per cent were implemented by the private sector.

However, by 1985, the state reviewed its public policies owing, in part, to the failure of the public sector to meet national goals and the inability of the state to manage and fund it. As a consequence, the public sector has undergone a slow process of privatisation since the second half of the 1980s (see 4.4.1 and Appendix D: Legislation Affecting the Organization and Operation of the Construction Industry in Libya). Many public factories, establishments, state-owned organizations and companies have since been privatized.

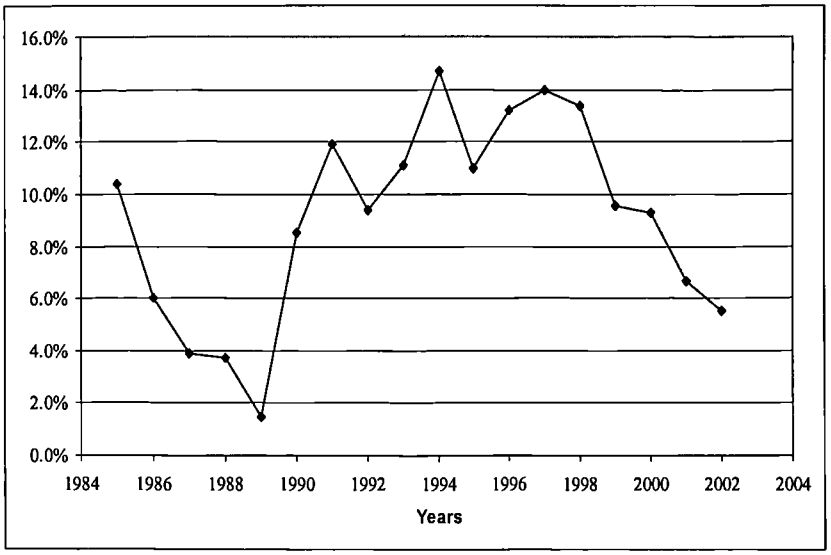
Furthermore, in 2000, the state introduced a huge plan for privatization with the aim of liberalising economic markets and privatizing state-owned companies. Moreover, in his speech in the General People Congress in June 2004, Al-Qadhdhafi indicated that the public sector in Libya had failed to achieve its objectives; he attributed that to bureaucracy and administrative corruption (LTV, June, 2004a). According to the International Monetary Fund (2005, p.5), "Since the freezing of the UN sanctions in 1999, Libya has been gradually implementing measures to reform and open its economy". However, the report concluded that "Libya is generously endowed with energy resources, but has one of the less diversified economies in the Maghreb (Libya, Tunisia, Algeria and Morocco) region and even among the oil producing countries".

To conclude this section, the Libyan economy has been based on and managed by the public sector since the second half of the 1970s. As a result, the public sector has played a dominant role in economic and social life. In turn, little attention has been paid to the private sector and its role in economic growth and the development process. However, since 1985, the public sector has undergone a series of privatization or acquisition processes aimed at encouraging the domestic and private sector to share in economic and social development. In 2003, the General People's Congress decided to rethink the public sector. In the construction field, public client organizations, consultancy and state-owned construction companies played a leading role in the construction sector particularly between 1978 and 1985. The impact of these economic issues on the CI and its operations is empirically investigated and discussed in the following chapters.

2. Inflation and the Exchange Rate of the Libyan Dinar

Owing to the fluctuations in Libya's economy in recent decades, it has experienced dramatic increases in the rates of inflation, particularly between 1981 and 1999. The major reasons for this can be attributed to the slump of oil prices since the beginning of the 1980s, the impact of sanctions in the 1980s and 1990s, and the dominance of the public sector. Figure 3.8 shows inflation trends between 1985 and 2002. Inflation grew dramatically to a peak at 14.7 per cent in 1994. However, since the UN sanctions were suspended in 1999, the rate of inflation has since fallen to 5.5 per cent in 2002. Therefore, it can be said that inflation has been characteristic of Libya's economic environment over the past two decades. Such an environment has caused serious damage and major challenges for the CI in terms of prices and financial losses. In 1983, the Libyan government adopted tight fiscal and monetary policies in response to the economic crisis owing to the slump in oil prices. The Central Bank of Libya tightened monetary policy and issued several restrictions in order to protect the balance of hard currency reserves in the Central Bank.

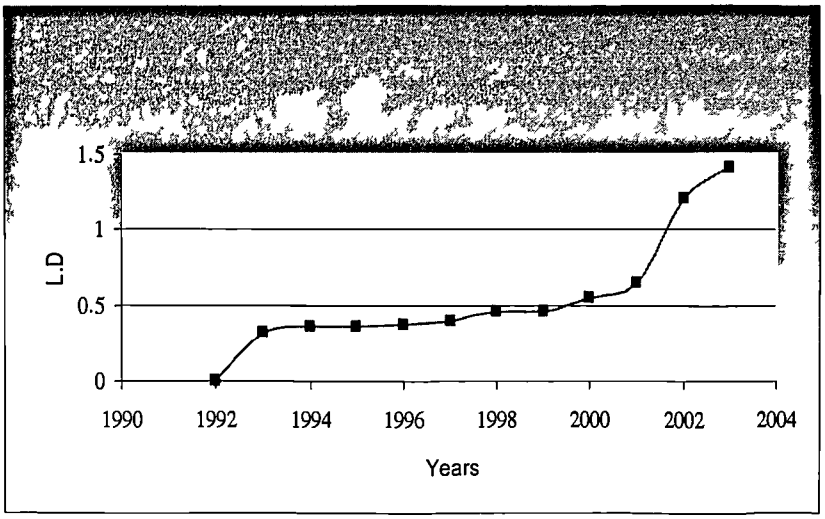
Figure 3-8: Inflation in the Libyan economy between 1985 and 2002



Sources: Complied and calculated from GCP (1999, 2000a, 2001, 2002, 2003); MP (1980) and CBL (2002 and 2003).

As a result of the above policies, the exchange rate of the Libyan Dinar against foreign currency experienced a series of changes in its value against the US Dollar. For example, the exchange rates of the LD increased from the LD 0.33 per US Dollar in 1992 to LD 1.4 per US Dollar in 2003 (Central Bank of Libya, 2003.).

Figure 3-9: The average exchange rate of the LD against the U.S. Dollar.



Source: Complied and calculated from Central Bank of Libya (2002, 2003, 2004)

These changes were associated with tighter restrictions with the aim of decreasing the imports of goods and services (see figure 3.9). For instance, according to decision No. 1351 of 1981, imports of goods, equipment, and construction workers were restricted within very limited ranges.

The CI was seriously affected by high inflation and the instability of the national currency in terms of the difficulties in obtaining import licenses and letters of credit, working in unstable financial and construction markets, sudden and unexpected increases in the costs of materials and workers, and shortages in imported construction materials and equipment. In addition, owing to the fluctuating exchange rates of the LD, the black market in hard currencies and imported construction materials flourished in the country, particularly during the period of sanctions. In addition, the Libyan market in general, and the construction market in particular, was seen as an unstable and risky environment. Therefore, the impact of the sudden changes in the rate of exchange of the LD on the construction industry's environment and its processes and operations is empirically investigated and discussed in the following chapters.

3. The Labour Force and Employment in Libya

In this section, issues of the labour force and employment in Libya are briefly highlighted from the perspective of their influence on the operations of the CI. The historical development, the size and structure of the labour force, the national and foreign

workforce, unemployment and the distribution of the workforce in different regions of the country are briefly highlighted.

A. Libyan Workforce

As mentioned in section 3.5.1, Libya has relatively few human resources and a small labour market. However, over the past five decades, the Libyan labour market has undergone significant changes. At the time of independence, according to the first Population Census, the total size of the workforce was around 335,000 (Ministry of Planning, 1954). In the 1950s and 1960s, more than of 70 per cent of the Libyan labour force were employed in agriculture (Glavanis, 1982, p.287). The employment and income of the vast majority of the population thus relied heavily on agriculture. However, since the mid-1960s, labour drifted away from the traditional agricultural economy to the oil, administrative, public and private sectors. As a consequence, the public sector has become dominant in the Libyan labour market since the beginning of the 1970s. However, owing to the small size of the national workforce and a lack of skilled workers, the labour Libyan market has depended on foreign workers.

According to a survey conducted in 2001 by the National Corporation for Information and Documentation (NCID), the workforce employed in Libya's economy totalled 928,989 employees; approximately seventy one per cent of which were males, and twenty nine per cent females. In addition, the survey showed that about eighty seven per cent of the total employed workforce were Libyan nationals. However, the survey did not consider the informal workforce (NCID, 2001, p. 18-20). Furthermore, the NCID survey also found that around eleven per cent of the total employed workforce in Libya in 2001 were illiterate, about eight per cent had not achieved the basic educational certificate, nearly twenty eight per cent had the basic educational certificate, around fifteen per cent had intermediate certificates from vocational institutions, about thirty per cent had secondary educational certificates, and thirteen per cent had university degrees (NCID, 2001, p. 21). Recent statistical data obtained from the General Committee of Workforce, Training and Operation (GCWTO) shows that the active workforce in Libya was about 1,329,200 in 2004. However, nearly twenty nine per cent of those employed in the formal Libyan economy are women.

The NCID survey showed that the vast majority of the workforce was aggregated in the public sector. Furthermore, analysis of recent data reveals that about sixty per cent of

the total workforce in Libya is aggregated in the Tripoli region, twenty one per cent in the Benghazi region, around twelve per cent in the Alkaleg region and only about seven per cent in the Sebha region (NCID, 2001, p.16-17). In effect, eighty per cent of the total workforce in Libya is aggregated in the northern coastal region. It may be concluded that the overwhelming majority of economic and construction activities in Libya are concentrated in this region. This is mainly owing to geographical, demographic and climatic circumstances.

From the above, the size of Libya's workforce and labour market in Libya is limited owing to the following factors:

1. Only around twenty five per cent of the total population are considered as the active workforce.
2. More than fifty one per cent of the total population is under the age of fifteen years.
3. There is only limited participation of women in the workforce owing to social and cultural circumstances.
4. The Libyan labour market is separated into the regional sub-markets of Tripoli, Bengazi, Alkaleg and Sebhah.

The above points lead to the suggestion that foreign workers are important factors in Libya's economy in general and in the CI in particular. This issue is discussed in the following section and empirically investigated in the following chapters of this thesis.

B. Foreign Workers in Libya

According to the Ministry of Planning, (1980, p.61), owing to Libya's limited human resources, its labour market has experienced a sharp increase in the number of foreign workers over the past four decades. Ibrahim (1987, p.180) calculated the significant changes in the number and proportion of foreign workers in the Libyan market between 1964 and 1983 as follows:

> "The percentage of the total foreign community to the total population increased from 4 per cent in 1964, to 4.2 per cent in 1970, to 13.7 per cent by 1975 and to 19.4 per cent by 1983. Moreover, the number of foreigners who were engaged in gainful occupation jumped from 16,000 in 1964, to 50,000 in 1976, to 223,000 in 1975 and to 562,000 by 1983, resulting in a substantial percentage increase of foreign employment in the country from 4.3 per cent in 1964, to 11.5 in 1970, to 32.9 in 1975, to as high as 47.7 per cent by 1983".

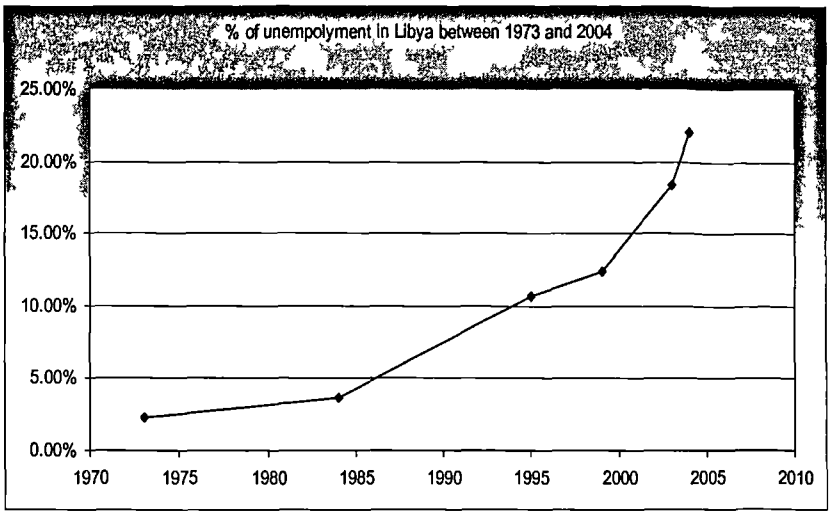
Nowadays, foreigners comprise a substantial proportion of the total workforce in Libya's market. The size and characteristics of the foreign workforce vary over time owing to political and economic conditions. For example, in March 2004, there were around two million foreign workers in Libya working in different economic sectors. However, more than eighty five per cent out of the total number of foreign workers were classified as illegal or informal workers. In addition, a majority of foreign workers were involved in informal activities in the CI and its associated operations (Al-Badrey, 2004).

From the above, it can be said that since oil revenues started flowing into the country, the number of foreign workers has increased dramatically. The influence of the foreign workers on the current and future operations of the LCI are empirically examined in the following chapters.

C: Unemployment

While hundreds of thousands of foreign workers have migrated to Libya seeking employment in different economic sectors in recent years (see chapter three and figure 3.7), one of the foremost problems facing society and the government in Libya is the increase in the level of unemployment.

Figure 3-10: The increase in the percentage of unemployment in Libya between 1973 and 2004



Source: Compiled and calculated from GCP (1999, p.15; 2001, p.9-10); LTV (2004) and GCWTO (2004).

Therefore, this section is devoted to briefly shedding light on this problem and the possibility for the CI to play a role in alleviating it. The data shows that the rate of unemployment in Libya has been increasing rapidly since the beginning of the 1990s.

According to the 1995 census, about twelve per cent of the total population in Libya was classified as unemployed (Ministry of Planning, 1995).

The report of the General Council for Planning (2001b, p.9-10) has indicated that unemployment rates increased from four per cent in 1984 to more than twelve per cent in 1999, and to twenty five per cent in 2000. Furthermore, at the First National Conference on Employment Policies in Libya, the Secretary of the General People's Committee of Workforce, Training and Operation (GPWTO) pointed out that the unemployment rate was between twenty and twenty two per cent of the total active national workforce. He added that the public sector employed about fifty one per cent of the total Libyan active workforce, and about thirty per cent of these were classified as excess workers[9] (LTV, May, 2004b). According to the Secretary of the General People's Committee (Prime Minister), in 2004 "there are more than 250 thousand job seekers" (Ghanem, 2004).

The above indicators reveal that the level of unemployment in Libya has risen sharply in the last ten years. Moreover, current demographic indicators show that its levels will probably rise significantly in the near future owing, in part, to the fact that a large number of the younger generations will enter the labour market (see figures 3.5 and 3.6). Consequently, the employment of youth will be a serious social and economic challenge. This means that the LCI should be considered of significance in generating employment opportunities and can join with other economic sectors in alleviating the impact of the unemployment problem in Libya. This issue is empirically investigated and discussed in chapters six, seven, eight and nine.

C. Development Planning in Libya 1950-2004

According to Drewer (1980, p.395), "there is a reasonably well-defined relationship between construction output and the level of development". Bon (2000, p.25) argued that "in the early stages of economic development, the construction sector grows faster than other sectors" This section gives a brief outline of development planning in Libya. The main objective is to consider development planning in the CI, and to understand its role in the achievements of Libya's national development aspirations and goals.

[9] The term 'excess workers' is used in the planning and economic literature in Libya to indicate the number of workers and official staff who are employed over the capacity needed by government departments and public companies.

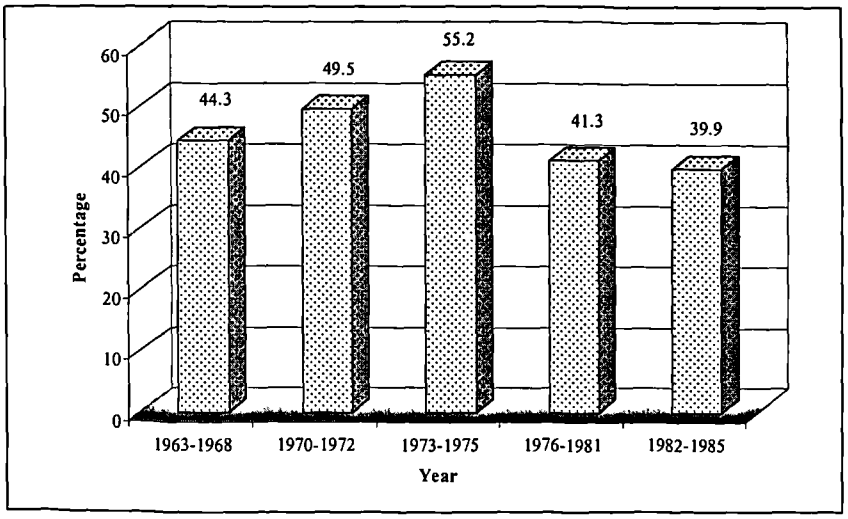
In 1952, the first Six-Year National Development Plan (1952-1958) was implemented and investment was focused on the reconstruction of public works and utilities, agriculture, education and training (Allan, 1981, p.73). In 1960, the World Bank Mission prepared their first report, 'The Economic Development of Libya'. This report suggested a five-year development plan. As a result, the first five–year development plan, 1963-68, was implemented; the central aim of which was to invest in construction and infrastructure (Ibrahaim, 1987, p.240). However, the Second Five Year Plan 1969-74 was not implemented because of the revolutionary change in September 1969.

Generally speaking, the development efforts increased after the flow of oil revenues began since the discovery of oil in Libya in the second half of the 1960s. The Ministry of Planning and Development was established according to Law No. 5 of 1963. In addition, in 1964 the government decided to spend between seventy to eighty per cent of the total oil revenue on social and economic development (Tripoli Chamber of Commerce and Industry, 1966, p.120).

From the above, it is clear that most of the development efforts during the 1950s and the 1960s in Libya were concentrated on investment in construction and infrastructure as well as the establishment of administration and the public sector (see chapter four). As a result, construction output was increased, and the position of the CI within the nation's economy and its role in the development process was strengthened.

In 1970, the revolutionary regime set up new principles and targets for development planning in Libya. The major aim was to establish a socialist society, so that social equity and security could be achieved, and to decrease the dependency of Libya's economy on oil so that self reliance and self-sufficiency could be attained (Planning Ministry, 1980, p.9). As a consequence, the revolutionary regime intervened directly in the efforts of social and economic development plans (see chapter four and appendix B). Therefore, four intensive development plans were adopted between 1973 and 1990. Added to this, after the early 1990s, the state adopted annual development budgets. As a consequence, significant portions of government expenditure were allocated to construction activities during the development plans. Figure 3.11 presents graphically the allocation of construction activities from the total state expenditure in development plans. This information shows that development planning relied heavily on the CI. However, after 1985, the CI experienced a period of recession (see 3.6.1 and 4.3.3).

Figure 3-11: Allocations for construction in different economic sectors (1970 and 1985)



Source: Compiled and calculated from reports of the Ministry of Planning (1976 and 1980) and General Council for Planning (2000).

Libya was classified as one of the world's poorest countries when it attained its political independence in 1951. The CI has since played an important role in the process of social and economic development. Developing planning over the past decades has relied heavily on the CI and its associated operations, as elsewhere.

3.7 Summary and Conclusion

This chapter has presented Libya as the location of the study. Section two began with a review of Libya's geographical characteristics within which the CI operates. It concluded that Libya is a large country comprising desert and semi desert lands. Four important geographical factors should be taken into account. These are deserts and desertification, the scarcity of water and drought, high and extreme temperatures and geographic dispersion. Furthermore, three main issues were raised in connection to the CI and its associated operations. These are that the vast majority of construction activities are concentrated in the northern regions; the transportation of construction inputs such as materials and equipment and communication are important; and the issue of water is an important issue in Libya's fragile environment. These issues are subject to investigate in the following chapters of this thesis.

In section three, the historical background of the country was very briefly introduced. In section four, the political environment in Libya was discussed and it was concluded that,

in spite of the fact that Libya has been classified as a stable country in terms of its political system over the past three decades, the country has experienced intense political and administrative changes in terms of the type of political organization, state structure, decision-making processes and administrative structures. Moreover, two main political issues relevant to the operations of the LCI were raised: the application of a socialist system in Libya in 1978 and the impact of international sanctions against Libya between 1982 and 2003. In addition, it was concluded that over the past three decades ideological and political fundamentals have strongly influenced social and economic life as well as the CI in Libya. The impact of the political ideology of the CI and its operations is subject to examination in the following chapters.

In section five, the social characteristics of Libya's population were highlighted, concluding that Libya is a relatively small country in terms of population but large in terms of area. Therefore, limited human resources are one of the key features of the country. In addition, a large proportion of Libya's population are young and a significant proportion of the population are not Libyan nationals. It was confirmed that urbanisation has been one of the most significant social changes in Libya over the past 50 years. However, Libyan society is still structured around a tribal system, and tribal values and loyalties are still strong in today's Libyan social context. Moreover, three issues relevant to the operations of the LCI were raised. The vast majority of future construction demand will be concentrated in urban areas. In addition, the demand for new housing units and maintenance work in the housing sector will put pressure on the CI in the coming years, and tribalism is likely to affect the operations of the CI in Libya. These issues are considered and are empirically investigated in this thesis.

Finally, section six discussed the Libyan economy, confirming that it is classified as an oil-based economy, and its overall performance is determined by oil production and its prices in international markets. In addition, fluctuation and instability have been the most important key features of the Libyan economy over the past three decades. It was confirmed that, since the mid-1970s, Libya's economy has been based on socialist principles, and as a result the public sector has been dominant in social and economic life. It was also found that Libya's economy experienced a period of drastic stagnation between 1983 and 1999 because of the influence of the slump in oil prices, international sanctions and the dominance of the public sector. Furthermore, a set of important economic issues

were raised in connection to the operations of the CI, such as the public sector and privatization, inflation, the exchange rate of the Libyan Dinar, the Libyan workforce and unemployment, foreign workers, and development planning in Libya. These factors and their impact on the operations of the CI are subject to investigation in the following chapters. Thus, the overall conclusion is that over the past three decades the CI in Libya has operated under various different political, social and economic development strategies, and several administrative and structural systems and forms of state intervention. It seems that, the current shape and operations of the LCI is a final result of its geographical, social, political and economic factors. In the following chapter, the organizational and technical development of the LCI and its current role and organization are explored and reviewed.

Chapter Four

4 Development and Organization of the Libyan Construction Industry

4.1 Introduction

This chapter reviews the historical development of the LCI and its current status. It explores and documents what the industry is currently like, and considers its development, role, and scope, as well as its present legal and institutional framework, its structure and its place in the country's economy. The key objective of this chapter is to identify those external and internal factors which have direct and indirect influences on the CI in Libya and its associated operations.

The chapter is organized into six main sections. The first section gives a brief outline of the history of construction in Libya, and explores indigenous construction activities and processes. Section two documents the evolution of the contemporary CI in Libya, and section three introduces the legal and institutional framework of the LCI. In section four, the scope and role of the LCI are identified, and in section five the structure of the industry is documented. Section six then introduces the qualifications, training and research related to construction in Libya.

4.2 Organization and Processes of Indigenous Construction Industry

In this context, the terms 'indigenous' or 'traditional' construction industry refer to the ways in which *construction activities* were organized and also to construction actions, operations and experiences in Libyan traditional societies before the beginning of the 1950s. The reason for considering this date as a starting point of the analysis is mainly because the organization, processes and operations of construction activitics have since experienced significant changes and development in Libya.

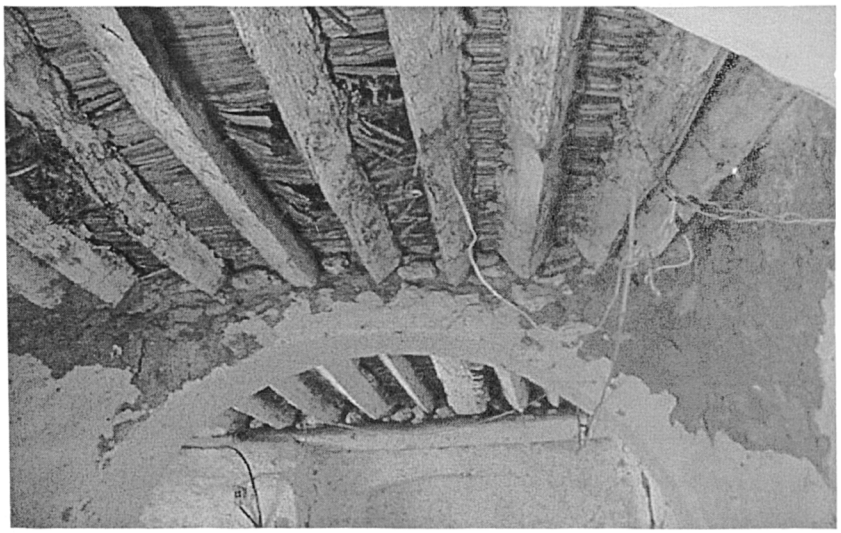
4.2.1 Traditional Construction Resources and Technology

According to Ngowi (1997, p.289; 2005, p.136), construction in traditional societies was a social activity conducted by all members of the society, and its processes and operations were structured around social participation. In addition, construction skills were

transferred from one generation to another and construction products reflected people's values and cultures.

From the observations and analysis of the remains of the ancient cities and construction products in Libya, a great deal about the way in which people organized and conducted construction activities can be deduced. For example, examination of figures 4.1-4-4 lead to the conclusion that people in Libya's traditional societies used local construction materials such as stone, earth, gypsum, animal skins and wool, palm and olive woods, reeds, and leaves and stems to construct their traditional shelters and settlements. Builders and craftsmen used stone and earth to construct walls, and palm and olive tree trunks as beams running along walls which were plastered by mud. Flat and vaulted roofs were widely used and buildings were built with one, two or three floors.

Figure 4-1 Palm reeds, leaves and stems used in roofs, Tajura-Tripoli region.

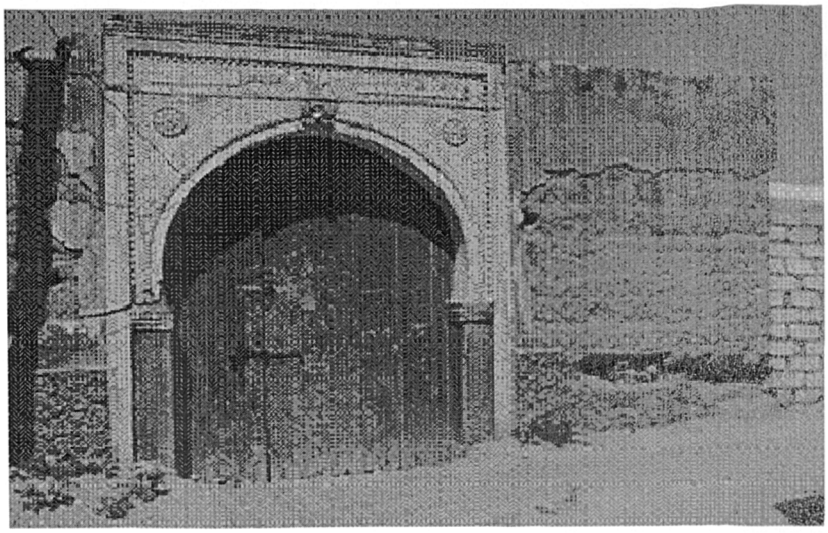


Source: Author (2003), a traditional house in Tripoli region

The above argument is supported by Abo-Gaied (2004, p.78) and Bahar et al (2004, p.118) who indicated that earth construction activities were one of the features of construction in North Africa particularly in desert and rural areas. Figures 4.1, 4.2, 4.3 and 4.4 show traditional construction materials and products, and give indications as to the traditional construction processes and operations in the Tripoli region. Therefore, through a process of deduction and a review of the few available studies regarding construction in Libya, such as those by Doxiadis (1964), Grifa (1997), Abo-Gaied (2004) and Al-Barony, (2004), generally, the nature of construction activities and their associated processes and operations can be classified in terms of materials and construction methods as follows.

Along the northern coastal belt (Tripoli, Benghazi and Al-kalig regions), earth–based construction materials and stone were dominant, as shown in figure 4.2.

Figure 4-2: Earth walls (Darb-Albab) in Souk-Aljuma,Tripoli region

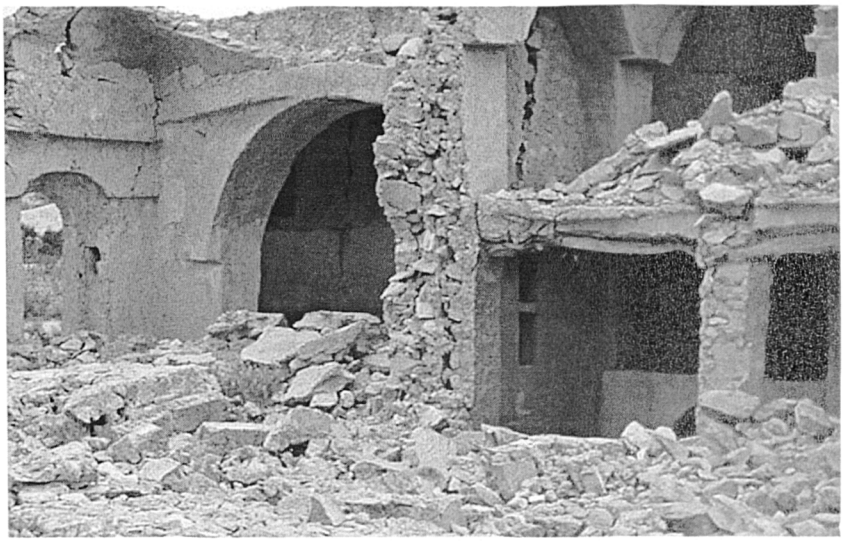


Source: Author, (2003), Earth wall, 1951, Tripoli region

However, in the northern mountainous regions, stone, vaulting construction systems and dug-out construction activities dominated. People used stone, gypsum and olive stems to construct their shelters. Figure 4.3 shows this type of construction. In addition, dug-out construction methods were used to excavate and form shelters. Underground dwellings such as man-made caves and subterranean or sunken courtyards in the western mountains in Garian and Al-Zentan in Libya, and in Matmata city in the south of Tunisia, provide good examples of the characteristics of construction products in arid and semi-arid regions (Petherbridge, 2002, p.181-202; p.103; Grifa, 1997, p.138).

In the desert and semi desert regions, *the nomads produced tents as a mobile and* dry structure to suit their lifestyle. Animal skin, hair and wool were used to produce this light and practical structure. The Bedouin tent is a good example of traditional construction products in hot and dry regions, which is produced without consuming any water. It is a mobile structure which is made from light materials so that it is easy to transport and construct (Al-Faqih, 1994, p.31). Moreover, people of desert oases, such as in the Fezzan and Kufra areas, used mud, stone and palm reeds, leaves and stems to construct their huts, thatch and shelters (Awotona, 1990). Thus, it can be said that construction materials and methods in Libya's traditional society reflect the impact of geographical factors on the nature and characteristics of construction (see chapter three).

Figure 4-3: Stone construction, western mountain, Tripoli region



Source: Author (1997), stone walls, 1950, western mountain, Al-Zetan, Tripoli region.

One lesson which can be learned from the previous discussion and examples is that the production and operational processes of the traditional built environment were largely based on dry construction materials and methods. In this sense, in general, it can be said that production and operations processes of traditional construction activities are likely characterized by low use of water owing, in general, to its acute shortages in such a fragile environment (see chapter three).

4.2.2 Indigenous Construction Processes and Operations

According to Hakim (1988, p.135), construction processes in most traditional Islamic societies such as Libya were based on experience and the decisions of clients and builders, as well as the participation of members of the society. In this sense, the role of the client was to state his/her construction needs and requirements, while the builders played the role of architects and contractors. Construction products were simple, mainly comprising low rise residential buildings, markets, etc (of between one and two floors). Furthermore, construction processes and operations were generally guided and controlled by the culture and the values of the society. Abu-Ghazzeh (1997, p. 230) and Hakim (1988; 2001, p. 89) pointed out that, in traditional Islamic societies, construction output and its associated processes and structural and architectural features were guided by laws and fundamentals prescribed in the Islamic religion. As a result, construction activities, in general, reflected people's beliefs, customs, opinions and culture.

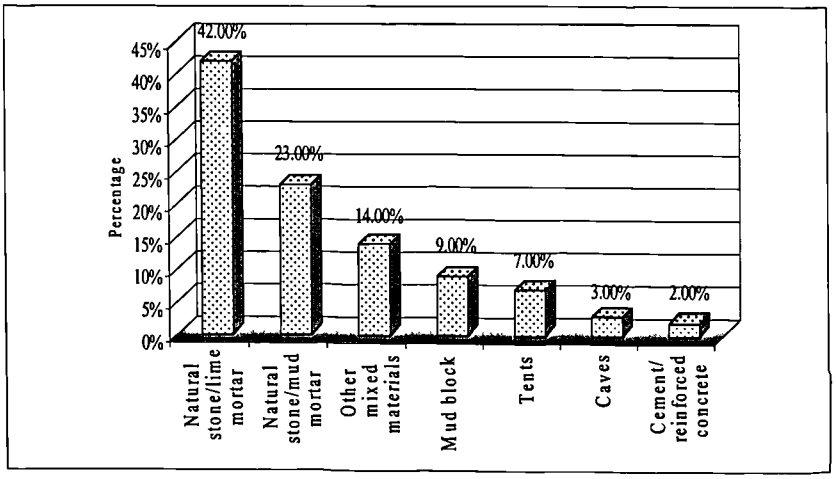
Therefore, indigenous construction activities in Libya's traditional society were organized around clients, builders and craftsmen. Production and operational processes were simple and relied upon the participation of all members of the society in planning, design, and operations. Furthermore, construction products were strongly integrated into their geographical, social and economic context. In short, construction was an indigenous and social activity, as. Miludi (1993, p.43) found when analyzing the context of the old city in Tripoli.

As mentioned earlier, it is interesting to observe that traditional societies in arid and semi-arid regions such as in Libya used dry construction materials such as stone, earth, trees, reeds, leaves and wool in their construction activities. The scarcity of water was one of the key factors which determined the nature, characteristics and methods of traditional construction processes and operations in Libya's traditional societies. In this context, the term 'dry construction' refers to construction production and operations processes which rely on dry construction materials, not consuming much water during the operation processes. According to the World Bank (1984, p. 83), "where water is scarce, the solution prescribed has been to adopt 'dry construction', using timber, metal, or asphalt".

4.2.3 The Shift towards Operations Based on Concrete Construction Materials and Technology

A sudden shift towards cement and concrete construction occurred after the beginning of the 1950s. Cement and its related products such as concrete, bricks and other materials became the dominant basic construction materials in Libya's construction market. As a result, the country's consumption of cement increased from 60 thousand tons in 1958 to 5.8 million tons in 2003 (World Bank, 1960, p.183; GCP, 2003, p.26). For example, as can be seen from figure 4.4, only two per cent of residential buildings in 1964 were constructed with cement and concrete (Doxiadis, 1964, p. 266). However, in 2003, according to the Research Centre for Building Materials and Construction (RCBMC) (2002), more than 96.7 per cent of buildings were constructed with cement and its products. There are many reasons behind these dramatic changes toward cement and concrete construction. The most important factors were the need to modernize the country's built environment and to increase construction productivity and output.

Figure 4-4: A breakdown of construction materials in housing stock in 1964



Source: Compiled from Doxiadis Association (1964, pp.265, 266, 272).

Furthermore, many researchers, including Al-Douri (1985, p.125), have argued that the transition in design principles and construction systems in most Arabic countries was mainly for social, economic and political reasons. Moreover, it was a consequence of communication and interaction with western civilization, changes in educational systems, and the employment of foreign consultants and construction companies in many construction projects. Also, concrete construction allowed the CI and its processes and operations to cope with high and sophisticated buildings and infrastructure works. Hakim (2001, p.88) stated that, owing to the influences of the colonial period, the traditional construction rules, systems and their associated local materials and processes were replaced by prescriptive architectural and construction systems organized around quantitative stipulations applied at local levels.

In short, it can be said that during the twentieth century construction work moved into a new era in which construction activities and operations changed in terms of their nature and organization. Construction changed from domestic and indigenous activities based on local and dry construction materials, to an industry structured around formal firms and projects, guided and controlled by professionals, formal construction regulations and standard materials. In addition, the industry's operations changed from domestic activities based on the accumulation of experience and skills to operations which relied on technical and skilled labour. Consequently, these changes caused significant shifts in the nature of construction materials, processes, operations, equipment and the skills of workers, as well as in the characteristics of construction products and the shape and operations of the CI in Libya.

As a result, new construction materials, skills, technology, equipment and machinery were introduced into the construction context (see 4.2 and 4.2.3).These crucial changes are regarded as a turning point in the history of construction in Libya in terms of management, procurement and operations. The CI has since been organized around firms and construction projects; and production and operations have been based on cement and concrete. It must be acknowledged that there are no means other than the cement and concrete industry which can enable mass construction output to be produced. However, the impact of this shift on the nature and characteristics of the CI and its associated processes and operations as well as its impact on the environment in Libya and other arid and semi-arid regions should be considered. .

4.3 The Evolution of the Contemporary Construction Industry

This section briefly introduces the historical development of the contemporary construction industry in Libya. For the purposes of the discussion, the course of the development of the LCI is divided into two main historical phases: pre-independence (before 1951); and post-independence (1951-2004).

4.3.1 The Construction Industry before Political independence (1911-1951)

As mentioned earlier, the Italian colonization (1911-1943) and the British and French administration (1943-1951) had a tremendous impact on construction development in Libya. The Italians introduced new design concepts, materials and construction technology and methods. As a consequence, indigenous construction activities began to lose their significant role at the beginning of the 1950s. Hakim (2001, p.88) described the changes and developments in construction materials, methods and operations during the occupation of the French in Morocco as follows:

> "The construction of buildings by the French using modern materials and technologies also impressed the Arab population. The buildings were higher, seemed to be better constructed, and the use of modern materials such as a glass on windows and store frontages, had their share of creating a shift in the mind-set of the Arab population towards their traditional built environment".

This statement applies to all Arabic countries which were occupied by western countries during the first half of the twentieth century such as Libya, Algeria, Tunisia, and many others. For example, any visitor to Tripoli city in Libya can observe the impact of the Italians colonists on construction. The existing administrative and commercial centre of Tripoli city is evidence of the influence of the Italians on the construction environment in

Libya in terms of design, construction materials and technology. From the examples in figures 4.5 and 4.6 (Tripoli city) it can be deduced that the Italians introduced their own construction standards, codes, laws and regulations into Libya's construction context. As a consequence, the construction processes and operations of the CI moved towards standardization.

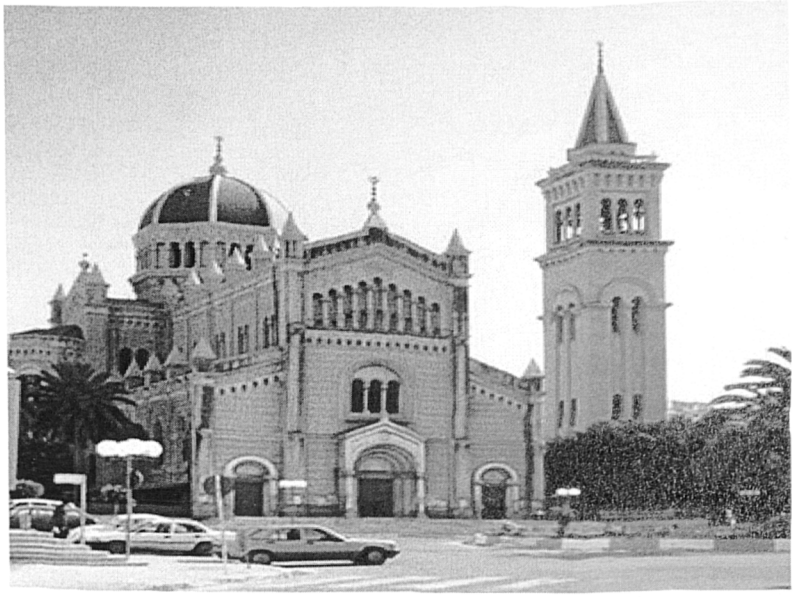
Figure 4-5: Italian building in the centre of the city of Tripoli

Source: author (2003), Omar-Al-Muktar Street.

In brief, during the colonial period, (1911-1943) and the British and French administration (1943-1951), new procurement methods, materials and construction systems were introduced. Therefore, Libya inherited a construction heritage and traditions from its colonial governments. Furthermore, they introduced new regulations, standards, specifications and codes, as well as new construction materials and technology to Libyan construction.

Thus, it can be said that construction activities changed from indigenous activities to trade and formal professional activities. In other words, construction and production processes were transformed from activities based on builders' experience to professional construction projects; and new methods of management, education and training systems in the construction field were introduced.

Figure 4-6: Tripoli, Maidan- Al-Jazaier, 1935



Source: author (2003).

In short, it can be deduced that the Italian colonial influence was one of the main drivers of changes in design, construction systems, and the nature and shape of the CI in Libya. In other words, the emergence of the contemporary construction industry in Libya was based on the principles of the Italian and British construction industries.

4.3.2 The Construction Industry after Independence (post 1951)

As mentioned in sections 3.3 and 3.6, the most significant economic factor which has affected the development and operations of the CI in Libya was the discovery of oil in the late 1950s and its exploitation since the beginning of the 1960s. Oil revenues enabled governments to increase their investment in construction. For example, between 1964 and 1966, the CI achieved a remarkable expansion in terms of the number, size and types of construction activities, and in its share in the economy as a whole (Government of Libya, 1966, p.268).

As discussed in chapter three, owing to Libya's limited human resources, the Libyan construction market experienced acute shortages in construction workers, and the vast majority of workers lacked skills and qualification in construction (ILO 1962, p.30). Added to this, the oil companies and government departments attracted many workers. These circumstances were associated with a gradual increase in demand for foreign construction workers and companies (see 3.5.3 and 3.6.3). According to a report of the

Ministry of Housing (1968, p.38-39), the CI in the 1960s in Libya was suffered from shortages of skilled construction workers; local contractors lacked the technical, administrative and financial capability to undertake medium and large construction projects; and a large proportion of construction materials were imported.

The response of the state to the above circumstances was to devote efforts to establishing an institutional and legal framework for the LCI. For instance, the Libyan Public Development and Stabilization Agency (LPDSA) was founded in 1952. Its central aim was to supervise public construction projects. In addition, the Libyan Construction Board was also established in 1956 with the aim to manage construction activities and coordinate different government ministries and departments which were concerned with construction and development efforts. The Libyan construction market was also opened to foreign construction workers and companies in order to overcome the problem of the shortages of construction workers, the low capacity of the local construction industry, and the lack of capability of local contractors. Also, the private sector was encouraged to participate in construction activities, and the government's investment in construction and the manufacturing sector increased.

According to the reports of the Ministry of Planning (1976, 1980), the country lacked basic buildings and infrastructure, Therefore, demand for new construction increased. However, the local construction industry was inefficient. To accelerate economic construction activities, the state adopted social and economic development planning and became heavily involved in construction. Added to this, private, public and foreign companies were encouraged to participate in social and economic transformation (for more details see appendix B). It becomes clear that, during that time, the state's efforts were concentrated on the establishment of an institutional and legal framework for the LCI with the aim to regulate its activities, operations and environment.

4.3.3 Construction Industry in the Revolutionary Era (post 1970)

As discussed in chapter three, on September 1996, Libya witnessed a significant political change. As a consequence, the CI and its environment have since undergone a series of changes and reforms in its role, management, structure and organization. The sudden influx of oil revenues in the 1970s, the implementation of socialist laws in 1978, urbanization, the failure of oil prices in the 1980s, international sanctions, unemployment, inflation, the unstable exchange rate of the Libyan Dinar and the intensive social and

economic development plans have been key factors affecting the operations of the LIC over the past three decades.

As detailed by the GCP (2002a, p.4-5), the CI in Libya operated according to different political, social and economic strategies over the past three decades. The GCP report grouped these strategies into three main phases: the first between 1970 and 1978; the second between 1979 and 1985, and the third phase after 1985. In what follows a brief outline is given of each phase.

1. The First Phase Between 1970 and 1978

In the 1970s Libya experienced a construction boom (see 3.6). Two main factors were behind the dramatic increase in construction activities at that time. Firstly, the sudden increase and influx of oil revenues as a result of the sharp increase in oil prices in the 1970s (see 3.6.1); and secondly, the great ambitions and commitment of the revolutionary regime to accelerate social, economic and physical development (see chapter three). The government of the time depended widely on foreign consultants and construction companies. On the other hand, it establishment a large number of large public construction companies, and increased the direct intervention and investment of the state in construction and its related sub sectors (Municipality of Tripoli, 1970; Siann, 1973; MP, 1980, p.32; GCP, 2000b, p.14). Furthermore, the state introduced new construction systems in order to increase the production and capacity of the CI and organized the economy around the public sector (see 3.6.3 and appendix B).

As a consequence, Libya at that time was often described as a large construction site. In this regard, Ibrahim (1987, p.181) stated that during this period, "Economic and social projects were built everywhere, and the country changed into a busy construction site. Moreover, the bilateral relationships between Libya and some other countries led to unchecked flows of migrants into the country from neighbouring countries (Egyptians and Tunisians in particular)". This indicates on the one hand that the LCI experienced a boom between 1973 and 1983, and on the other hand that the LCI contributed significantly to the GDP and social and economic changes in the 1970s and 1980s (see 4.5.2).

A review of the planning literature (MP, 1980; MH, 1982, 1985 and GCP, 2000b and appendix B) reveals that, during this period, there was intensive investment in construction and the state was involved directly in housing production and construction provision, and

introduced new construction materials and technologies (see appendix B). Consequently, the CI experienced a boom. However, the construction market was dominated by public companies, and foreign construction enterprises and workers (see 3.6.2).

In short, the construction market attracted a large number of foreign consultants and construction and commercial enterprises. This influx was associated with the intensive economic immigration of foreign workers from several countries.

2. The Second Phase Between 1978 and 1985

As discussed in detail in chapter three, socialist laws were implemented in Libya in 1978. The LCI was reorganized in order to follow the principles of socialism. As a consequence, the organization and operations of the LCI experienced significant changes. The economic environment and its activities were structured heavily around the public sector. Consequently, private construction and consultant firms were prohibited or forced to change their organization and management systems according to the partnership system. In addition, some companies were amalgamated to become new public companies. Public ownership became the dominant mode. As a consequence, all economic activities based on individual capital were prohibited (see 3.4.2). Furthermore, the employment of Libyan workers by Libyan citizens was forbidden (GCP, 2002a, p. 12). According to socialist laws, Libyans must be partners and not wage earners (see 3.4.3). As a result, the employment of foreign workers was organized according to decision No. 195 of 1991 (Government of Libya, 1991). These circumstances can be regarded as important external factors which affected the organization, structure and the overall picture of the CI in Libya.

However, the political, social and economic issues of the 1980s and 1990s relevant to the LCI included the collapse of oil prices, the implementation of socialist laws, the withdrawal of foreign workers and companies, and international sanctions (see chapter three). Many new construction projects were postponed, and large numbers of on-going construction projects were stopped or suspended. In addition, payments to consultants and construction companies were delayed, in some cases for more than four years. Also, many public companies and organizations were abolished or collapsed, and hundreds of foreign consultants and construction firms suspended their activities and withdrew from the Libyan construction market, particularly during the sanctions period of 1992-1999 (see 3.6.3).

Furthermore, as mentioned in section 3.4.1, the state readjusted its administration and institutions several times after the beginning of the 1980s.

From a review of the planning literature and data relevant to the CI and its activities, The LCI and its environment were organized around the public sector between 1978 and 1985. Therefore, the supply and distribution of construction materials and services were controlled by the state and public bodies (see 3.6.3). Consequently, Libyan public firms dominated the construction market. In turn, a large number of foreign firms withdrew from the Libyan construction market owing to the political and economic circumstances, as discussed in chapter three.

Thus, between 1978 and 1985 the industry experienced remarkable changes in its role, management, organization and structure. In general, the industry was reorganized according to the principles of socialism. As a result, the possibility to run an individual firm in construction and associated trades was restricted.

3. The Third Phase after 1985

Following the social and economic circumstances of the 1980s (see 3.6.3), the LCI witnessed a construction recession between the second half of the 1980s and the end of the 1990s. According to the GCP (2002a, 2002b, 2002c), the state withdrew from housing and construction provision (see appendix B); the reorganization of the CI by the state allowed Libyans to establish firms in construction business and its related activities in the Libyan construction market since the mid-1980s (see 4.4.1); the public construction sector was privatized (see 3.6.3); and the private sector was encouraged to participate in construction in terms of investment and operations.

Furthermore, in 1985, the state decided to adopt a new approach in reorganising and restructuring the LCI. According to law No. 9 of 1985 (Government of Libya, 1985), Libyans were encouraged to establish services and construction firms. The law allowed Libyans to run consultancy and construction firms according to the partnership system. This is mainly because the public construction sector had failed to meet national construction requirements and expectations. Therefore, the state launched a national programme with the aim to privatize the public sector (see 3.6.3 and appendix B). Consequently, the CI was restructured and reorganized according to partnership principles;

and a large number of public construction firms and establishments have undergone privatization since 1985.

In brief, since 1988, the state has attempted to rebuild the LCI. Great efforts have been made to encourage the private sector to participate in the CI by establishing services, consultancy and construction firms. These issues and others emerging in this section will be investigated empirically in the following chapters.

4.4 Legal and Institutional Framework

This section provides a brief review of the current legal and institutional environment of the LCI. The information in this section is based on an analysis of the laws and regulations relevant to the management and organization of the CI and its environment in Libya (see appendix D).

4.4.1 Legal Framework

The CI in Libya is regulated by law No. 9 of 1985, law No. 9 of 1992 and law No. 21 of 2001 and their associated amendments concerning the rules regulating the Libyan economy and the establishment of firms in the Libyan market. These explain the conditions and procedures that are required to establish a firm in the CI. In addition, decision No. 8 of 2004 concerns the tendering and contracting procedures of construction projects (Government of Libya, 2004b). As well as these three key laws, the legal framework includes a set of regulations in connection to design codes, the standards for construction works and buildings, the conditions for employing construction workers and of starting up firms in the construction market. A list of the most important laws, rules and decisions regarding the CI and its firms are summarized in appendix D. The main purposes of the above laws are to encourage Libyans to be directly involved in the construction business by running consultancy and construction firms; to increase the number of partners in firms in order to create more social participation in construction investment; and to achieve an equitable distribution of income; and to prevent the establishment of any private construction firms (one-man or sole ownership firms) (see 3.4.3).

On the basis of the above legal framework, construction business has been controlled by the principles of the partnership system. Thus, any number of Libyans, such as engineers, investors, contractors, suppliers and any others, can apply to start up a small firm which is called in Arabic 'Tasharrukyya' or a partnership firm 'Sharika Musahima' on

the basis of partnership or cooperative principles. In this context, Tasharrukyya and Sharika Musahima can be defined as any domestic construction firm established, owned, funded and operated by partners. This concept coincides with the definition of the ILO (2004, p.249) of the cooperative firm as "a firm or a collective of firms, owned by their members, and involved in the production, distribution, or consumption of products".

According to the procedures and instructions of the Commercial Registration Offices of the General Peoples Committee for Economy and Trade (GPCET) in Tripoli city, the process of starting up a construction firm commences by submitting a written application, with the required registration documents, to the GPCET. The application must be attached with a list of five persons who would form the administrative committee of the firm. The name of the general manager, the name and address of the firm, the objectives and the scope of activities of the firm, the type of business, a list of partners, their addresses and their identity numbers, the value of capital invested in the firm, a list of equipment and machinery, and a list of engineers and permanent staff, should be explained and submitted to the committee. After the Commercial Registration Office has made a positive decision, a license is issued, giving the firm legal status and determining its scope of activities.

On the other hand, the legal framework that regulates the consulting sector in Libya is based on a set of laws and decisions concerning the rules regulating the engineering and consulting sector in Libya. These divide consulting works into consulting and engineering offices and firms and determine the main conditions and procedures to run a business in the LCI (Ministry of Housing, 1985). According to this regulatory framework, the General Association for Engineers (GAE) is responsible for regulating the consulting sector in the country. In order to run a business in the consulting sector it is essential to apply to the GAE.

In conclusion, it can be said that the legal framework of the CI is based on partnership and public ownership principles. Again, this reflects the intention of the state to employ the CI as means to achieve political and economic goals. The influence of the state on the processes and operations of the CI will be empirically investigated and discussed in the following chapters.

4.4.2 Institutional Framework

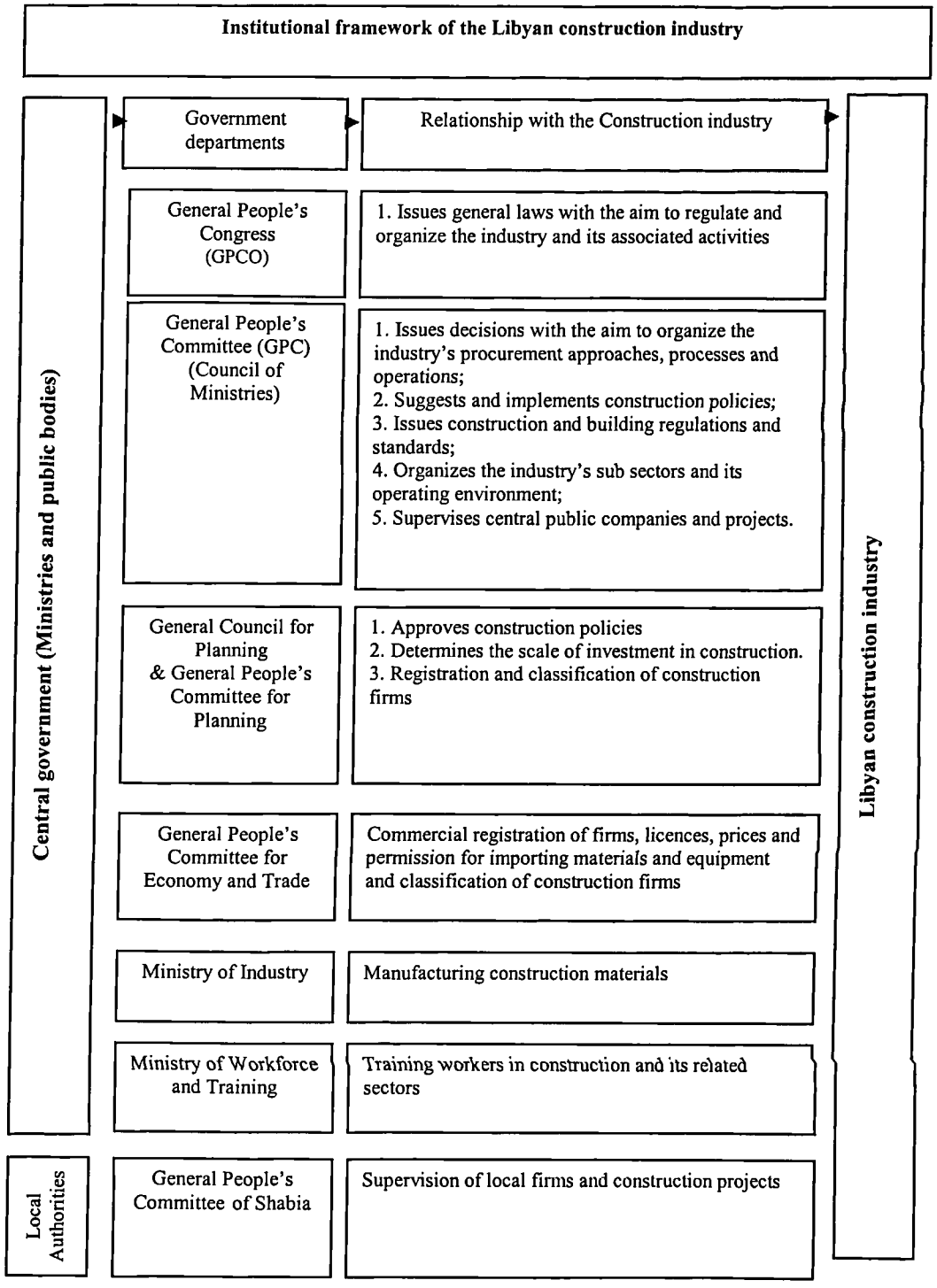
Edmonds and Miles (1984, p.21) argued that the fundamental problem of the CI is that: "the systems and procedures relate to distinct divisions between the responsibility for planning and design and the responsibility for construction". As mentioned in section 3.4.1, the process of decision making in Libya is fragmented between political, planning and executive authorities. Therefore, this fragmentation might affect the size, structure and organization of the institutional framework of the LCI. At the time of this study, the institutional framework of the LCI is organized at two levels:

1. Central Ministries (usually the Ministry of Housing) and other central government departments are responsible for the supervision of central large state-owned consultancy and construction companies.
2. Local authorities (Shabiat) supervise local small public construction companies.

Table 4.1 illustrates the authorities, ministries and government departments responsible for the regulation, management and supervision of the LCI at the time of the study. National construction strategies and policies are guided by the General People's Committee (GPCO) (parliament), the General People's Committee (GPC) and the central Ministries. Then, the policies are implemented at department level and by local authorities (Shabiat) and companies.

However, the administrative sector and institutional framework of the LCI have experienced a series of changes since 1970. For instance, between 1970 and 1985, the Ministry of Housing was the main government agency with a leading role in the management and supervision of the CI. However, in 1985 this ministry was abolished. As a result, the CI was fragmented between different ministries and economic sectors. Again, in 1990, the Ministry of Housing and Utilities was established, and took responsibility for leading and supervising the CI, but this was also abolished in 2000. Since then, several central and local government ministries and departments have been involved in the management and supervision of the CI. This illustrates that the organizational structure of the LCI has been under a continuous process of reforms and changes since the 1970s.

Table 4-1: The institutional framework of the LCI at the time of the study



Source: Compiled from Law No. 9 of 1985, Law No. of 1992, the annual reports of GCP (1999, 2001, 2003)

The information in table 4.1 shows that, at the time of this study, the CI and its related activities are managed and organized by many government departments. Also, the funding of public construction projects is controlled by the General People's Committee for Finance (GPCF). Research and development efforts are planned and conducted by the

Industrial Research Centre, the National Centre for Specification and Standardization (NCSS), and the Research Centre for Construction and Building Materials (RCBC). The information in the table reflects the extent to which the LCI is fragmented in terms of management and supervision. Furthermore, firms in Libya are generally classified into 'Tasharrukyya' and 'Sharika Musahima' or central and local firms. The classification and size of a firm usually depends on the value of capital put into the business, the number of partners and employees, and the pattern of ownership.

As mentioned, the classification of firms varies from one country to another owing to national criteria (Ofori, 1991, p.20). However, small, medium-sized and large firms are a common classification (see chapter two). In Libya, there has been no clear definition of the size of firms in the CI at the time of this study. For the purpose of this study, firms were classified into small, medium and large according to their annual turnover, workload (number of projects in hand) and the number of permanent staff. Consequently, a firm is considered as small if its annual turnover is LD 500,000 or less, its workload is five projects or less, and it employs less than ten permanent employees; a firm is considered medium if its annual turnover is more than LD 500,000 and less than LD one million, its workload is more than five and less than ten projects, and it employs more than ten and less than twenty-five permanent employees; and a firm is considered large if its annual turnover is more than LD one million, it employs more than twenty-five permanent employees and its workload is more than ten projects. The empirical research in this study investigates this issue further.

From the above, the management and organization of the firms and projects of the CI are initiated and supervised by different administrative sectors. This gives an indication that the fragmentation of the industry is one of the organizational features of the LCI. In addition, no particular organization leads these activities and development. These two issues and their impact on the CI will be investigated empirically in the following chapters.

4.5 The Current Scope and Role of the Construction Industry

This section highlights the current scope and role of the CI in Libya, commencing by identifying the definition of the term 'construction industry' in Libya's planning literature. The contributions of the LCI to the Gross Domestic Product (GDP), the Gross Fixed Capital Formation (GFCF), employment and the development processes are then discussed.

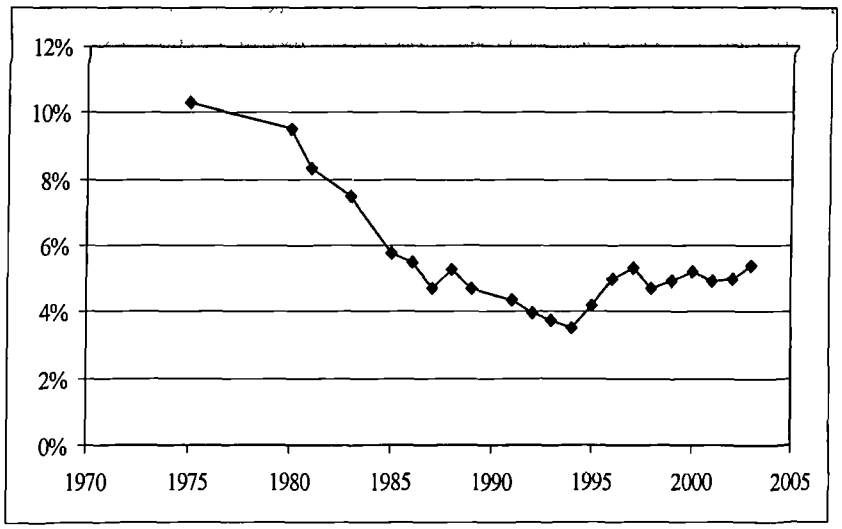
4.5.1 Definition of the Industry

At the time of this study, the CI in Libya is known as the "Construction and Building Sector" (CBS). The CBS can be defined as the economic sector which is involved in planning, design, construction production and operations, maintenance, repair, alteration, demolition and other improvements of buildings and civil infrastructure works. It comprises two important sub-sectors: the consulting and construction sectors. The producers and suppliers of construction and building materials are included in the CBS (GCP, 2004). However, the clients of construction projects and plant hire sector are not included in the scope of the CBS, in spite of their vital role throughout all construction processes. The empirical research will investigate how those involved in the CI in Libya understand the term 'the construction industry'.

4.5.2 The Position of the Construction Industry in the Libyan Economy

Figure 4.7 presents graphically the contribution of the CI to GDP from 1975 to 2003. As can be seen in the figure the contribution of the industry declined from 10.3 per cent in 1975, to 5.8 per cent in 1985, then to 4.2 per cent in 1995 and rose to 5.3 per cent in 2003.

Figure 4-7: Share of the construction industry in GDP in Libya between 1975 and 2003



Source: Compiled from data in the reports of the Ministry of Planning (1980, 1996), the National Corporation of Documentation and Information (NCID) (2001, 2002), and the General Council for Planning (2000a, 2002, 2003, 2004), Tripoli, Libya.

It is clear that there was a sharp decline in the share of the industry in the GDP between 1983 and 1998. This was mainly because of the political and economic conditions in that period, together with changes in the role of the state in social and economic development plans since 1985 (see chapter three). However, since 1999, the share of the CI

in GDP has been increasing steadily owing, in part, to the cancellation of the United Nation's sanctions and the remarkable increases in oil prices over the past five years (see chapter three).

Furthermore, the CI in Libya also makes a significant contribution to the Gross Fixed Capital Formation (GFCF). During the period 1975- 2002, between 65 and 70 per cent of GFCF in Libya was produced by the construction industry (MP, 1976, 1996; GCP, 2002c). This high contribution is mainly because of the following reasons:

1. A significant proportion of the huge investment by the state was devoted to new construction;

2. A great proportion of the country's investments have been allocated to strategic capital projects such as the Man-Made River Project, which is one of the largest civil construction projects in the world (see 1.1.1).

To sum up this section, it can be said that the role of the CI in the economy and its contribution to the GDP and the GDFC in Libya for the 1975-2003 period has experienced cyclical changes and fluctuations. These reflect the political, social and economic circumstances in the country over the past three decades (see chapter three) and on the other hand, the nature of demand in the CI itself.

4.5.3 Employment in the Libyan Construction Industry

The analysis of the available secondary resources and data show that the trends of employment in construction in Libya have experienced significant changes in terms of numbers of employees over the past three decades. For example, during the construction boom of the period 1970-83 the formal construction industry employed around 16 per cent of the total workforce in Libya (Wells, 1986a, p.21). During the recession period between 1985 and 1999 the number of employees decreased dramatically. However, since 1999 employment has increased significantly, owing in part to the state's policy of increased employment in construction by encouraging Libyans to start up partnership firms and become involved in construction activities in terms of both investment and operations (see 4.3.3).

According to the General Council for Planning (GCP, 2004), the LCI employed around 3.2 per cent of the total workforce in the formal Libyan economy in 2003. This

figure did not include those working in the construction and building materials industry. Also, it should be noted that construction professionals (architects, quantity surveyors, civil engineers and others working in the consulting sector) were excluded. Moreover, the figure also did not include those working in the informal construction sector, of which, however, only about 1.25 per cent were Libyans. The reasons underlying the low representation of Libyans in construction are investigated empirically in the following chapters.

A review of government reports and official data shows that little attention has been given to the statistics relevant to employment in the CI; thus the available data do not include self-employed and informal construction workers.

4.6 Structure and Organization of the Industry

This section discusses the structure and organization of the LCI at the time of the study. It is based on information compiled from the planning and economic literature and an analysis of the available data relevant to the industry and its associated sub-sectors.

4.6.1 The Composition of the Construction Industry

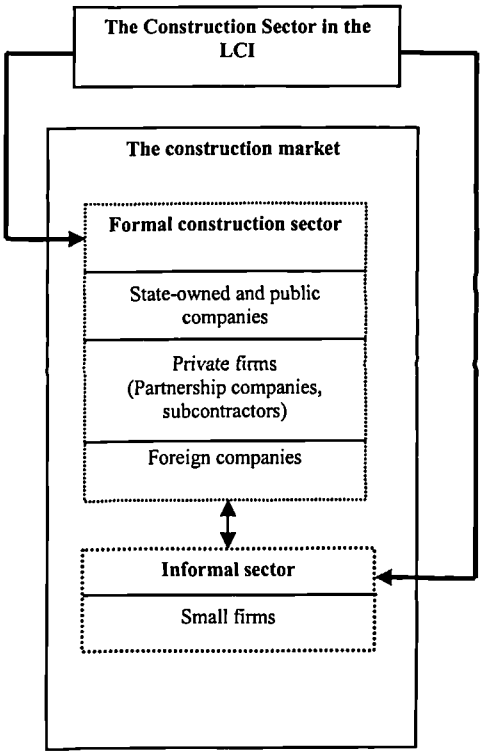
The planning literature and past experience of the current researcher show that, in Libya, the building sector is dominated by local small and medium-sized construction firms, and a significant proportion of building construction activities is carried out by the informal construction sector. However, the civil engineering sector is dominated by the state-owned companies and large foreign enterprises in both design and construction. A review of the contracts for construction projects in 2002 (GCP, 2001a, 2001b, p.18-22) shows that there is no clear dividing line between the building and civil engineering sector; and consultancy and construction firms usually operate in both sectors. Thus, it can be said that, as elsewhere, the CI in Libya comprises building and civil engineering sectors.

4.6.2 The Construction Sector

At the time of this study, it was observed that the formal construction sector is the largest sub-sector of the LCI. In general, the sector is responsible for the production, development and maintenance of Libya's physical built environment. An examination of data obtained from the Commercial Registration Office in March 2004 (GPCET, 2004) showed that there was no detailed data about the construction sector. However, in general, the sector comprises state-owned companies, public organizations and foreign enterprises,

and corporate or partnership firms. The structure of the construction sector in the LCI is presented graphically in figure.4.8.

Figure 4-8: The structure of the Libyan construction sector.



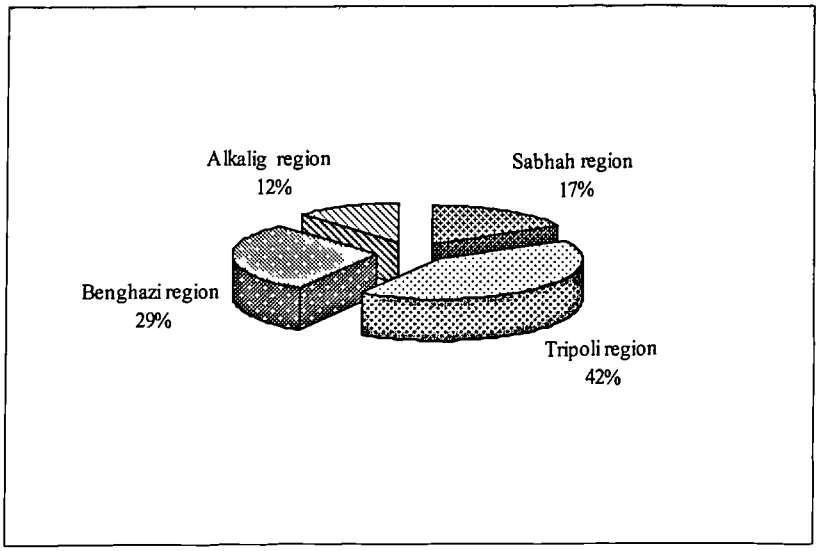
Source: Based on information compiled from: law No.9 of 1985 concerning the establishment of small firms (Tasharrukyya), law No. 9 of 1992 concerning rules of the organization of economic activities and the annual reports of the GPCET (2001, 2002, 2004) and GCP (2002, 2003)

As discussed previously, the construction sector has also experienced intensive changes in terms of regulations, administration, management and supervision (see 4.3.1, 4.3.2, 4.3.3 and 4.4.2). According to data obtained from the General Peoples Committee for Economy and Trade (GPCET) in March 2004, the construction sector in Libya comprises 4195 registered construction firms. These figures did not include informal construction firms and self-employed workers. In this context, it is important to state that the number of construction firms has been subject to rapid changes owing in part to frequent changes in the laws and regulations related to the organization of the construction sector and its associated firms.

As can be seen in figure 4.9, eighty three per cent of the total number of firms were based in the northern coastal regions (Tripoli, Al-kalig and Benghazi). Forty two per cent

of the firms were concentrated in the Tripoli region, twenty nine per cent in the Benghazi region, twelve per cent in the Al-kalig region and seventeen per cent in the Sebhah region. These figures demonstrate that the distribution of construction firms (as in most other countries) is affected by the distribution of the population, the workforce, settlements and economic activities in the county.

Figure 4-9: Percentage distribution of construction firms within the four regions in 2004

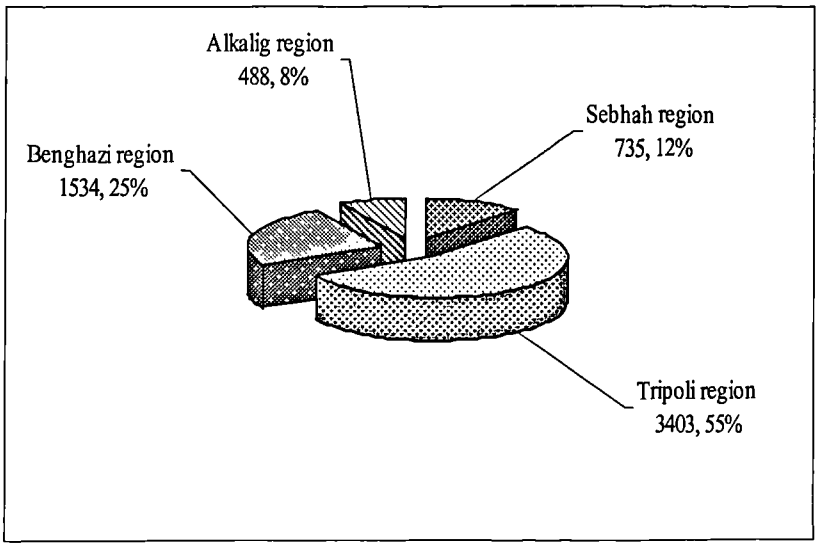


Source: Based on data obtained from the People's Committee of Economy and Trade (GPCET, 2004), in March 2004, Tripoli, Libya.

Furthermore, the analysis of the data in the report of the General Council for Planning (GCP, 2003, p.32-33) relevant to construction projects reveals that there is a strong relationship, in terms of number of projects, between the distribution of construction firms and the locations of projects. As can be seen in figure 4.10, nearly eighty per cent (5425 projects) of formal construction projects in Libya in 2002 were concentrated in the northern coastal belt (Tripoli, Benghazi and Al-kalig regions), the rest being in the southern Sebhah region. Fifty five per cent (3403 projects) were in the Tripoli region, 25 per cent (1534 projects) in the Benghazi region, 12 per cent (735 projects) in the Sebhah region, and 8 per cent (488 projects) in the Al-kalig region.

Again, geographical, demographic and economic circumstances influence the distribution of construction output. Furthermore, the above figures confirm the following points.

Figure 4-10: Distribution of construction projects within the four regions in 2002



Source: Based on data in the report of the General Council for Planning (2003, p.32-33), Tripoli, Libya.

Firstly, the vast majority of the operations of the LCI take place in the northern regions; secondly, the Tripoli region probably has the largest and most competitive local market in Libya, and the largest and most important construction market in terms of numbers of firms and projects and availability of construction resources. Thirdly, the Libyan construction market is divided into four local construction markets (the Tripoli, Benghazi, Al-kalig and Sebhah regions) separated by large distances.

2. The Informal Construction Sector

In Libya, the informal[10] construction sector and its influence on the operations of the industry has been reported and considered by several reports (GCP, 2002a, p. 13; Al-Badrey, 2004). This gives an indication that the informal construction sector is of significance in the LCI. Based on the present researcher's experience in working in Libya over the past two decades, it is believed that, the informal construction sector carries out most small and micro construction works such as building private houses, and the maintenance, alteration and transformation of residential and non-residential buildings, as in most developing countries (see chapter two). Owing to time constraints, the informal construction sector is not within the main scope of this study (see 1.3). However, it seems that the issue of the informal sector would be raised as one of the factors which have

[10] It was observed that policy and decision makers referred to the informal construction sector using the term "illegal construction activities". This implies that the sector has a poor image, and its role in construction production has not been appreciated.

affected (and are affecting) the nature and shape of the LCI and its associated operations. Therefore, the sector is empirically identified in the following chapters.

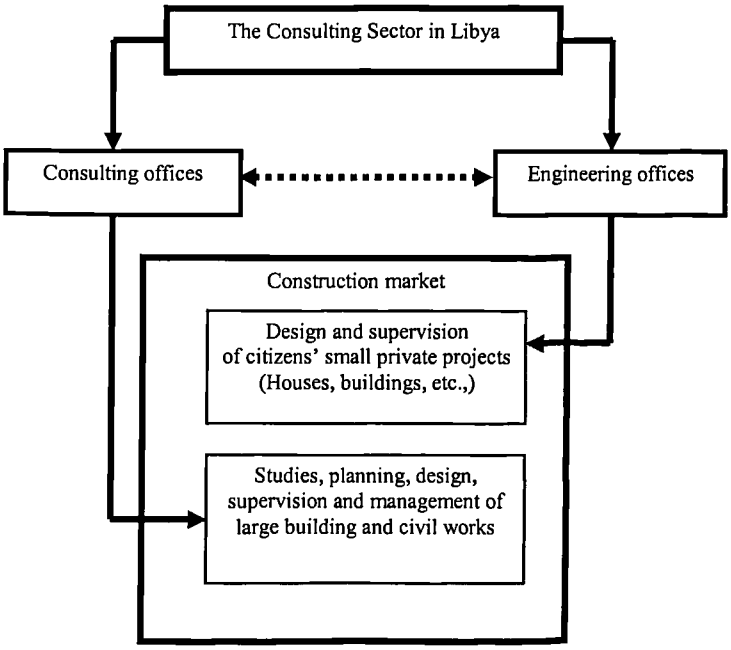
4.6.3 The Consulting Sector

Based on the review of documents and data obtained from the General Association of Libyan Engineers (ALE) in March 2004, it can be said that the evolution of the Libyan consulting sector can be traced back to the middle of the twentieth century (see 4.1.2). Al-Gallie et al. (1998, p.178) indicated that, when Libya attained its political independence in 1951, it lacked any national consulting sector owing to the acute shortage of Libyan architects, engineers and technicians. As a consequence, consulting and engineering works were monopolized by Italian engineering offices. However, at the beginning of the 1960s, small numbers of Libyans established engineering offices which were involved in small consulting works related to the design and supervision of small private housing development.

The Libyan construction market attracted hundreds of foreign consultancy and construction companies in the 1970s (see 4.3.1, 4.3.2 and 4.3.3). However, as a consequence of the political and economic circumstances of the 1980s and 1990s (see 3.6.3), most consultancy and construction firms withdrew from the Libyan construction market. Therefore, the second half of the 1980s saw the interest of the state in building up a national consulting sector. Five public consulting offices were established between 1980 and 1986 (Government of Libya, 1981). Three were in Tripoli; one was in Benghazi and the other was in Sebhah. Three of these were still working at the time of study. Furthermore, since the beginning of the 1990s the state has encouraged Libyan engineers to establish engineering offices and consulting firms. As a consequence, numerous local engineering offices and consultancy firms were founded according to the laws and regulations mentioned in section 4.4.1 and their amendments.

At present, the consulting sector is an important sub-sector of the LCI; it is responsible for the planning and design phases (pre-contracting phase) of the construction process, as well as the supervision and management of construction work (see 2.8.1). Figure 4.11 presents graphically the structure and organization of the Libyan consulting sector at the time of the study.

Figure 4-11: Structure of the consulting sector



Source: Compiled from (ALE, 2004), Abn-Altieef et al. (1998) and (Ministry of Housing, 1985).

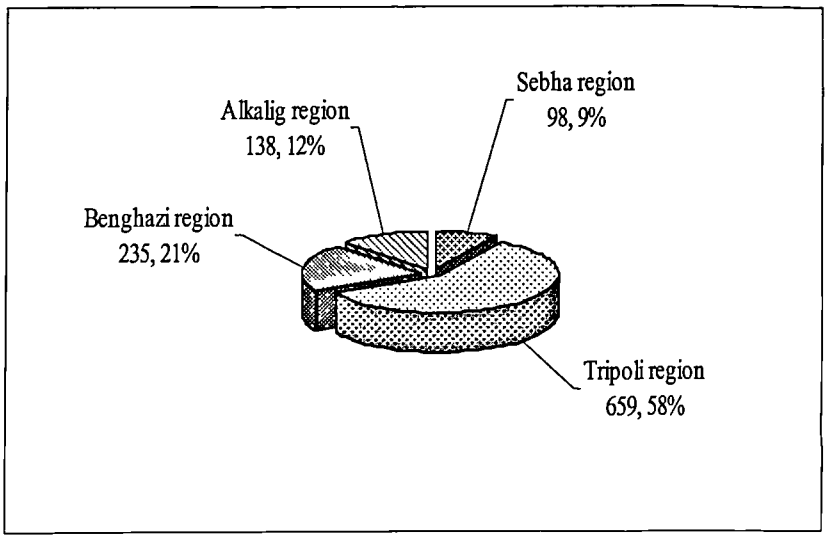
Abn-Altieef et al. (1998, p. 387) reviewed the state's decisions and laws concerning the organization of consulting work, and showed that the sector comprises both national and international private and public establishments and firms which are involved in the planning, design, supervision and management of engineering and construction works. The international consultancy firms dominate in the civil engineering industry and sophisticated buildings, while the national consulting sector is concerned with other building projects (Al-Taweel, 1998, p. 474). This issue is investigated empirically in the following chapters.

According to the General Association for Engineers (GAE) in March 2004, there were 1130 Libyan architects/engineering and consulting offices and firms registered with it. Sixty seven per cent of the total number were engineering offices while the rest were consulting offices or firms. It should be noted that foreign consulting firms are not included because these were registered with the General People's Committee of Trade and Economy. Also, it should be noted that these figures are subject to considerable change over time.

Furthermore, the distribution of firms of the consulting sector in the different regions of the country is influenced by geographical and demographic circumstances (see

chapter three). Nearly eighty-five per cent of the total firms were based in the northern regions (Tripoli, Benghazi and Al-kalig). These figures confirm that the majority of the operations of the LCI are concentrated in the northern regions. This may imply that a large number of professionals and educated designers, contractors and clients are also working within these coastal regions.

Figure 4-12: Percentage distribution of engineering office and consultancy firms in 2004.



Source: Based on data obtained from the General Association of Libyan Engineers (ALE), March 2004

On the whole, Libyan consultants are responsible for the planning, design and management of construction works (as in other countries). However, the sector has a short history. Until the mid 1980s, the vast majority of construction projects were undertaken by foreign engineering and consultancy firms.

4.6.4 Construction and Building Materials Industry

This section briefly reviews documents and data concerning the construction and building materials industry in the LCI. The section is based on the information compiled from, and analysis of data from, secondary resources relevant to construction materials.

As discussed earlier, the organization of the processes and operations of the CI in Libya changed to cement and concrete construction during the twentieth century. Consequently, the construction and building materials industry became one of the most important industries in the country owing to its strong relationship with the operations and productivity of the CI and its related activities. For instance, more than 70 factories were

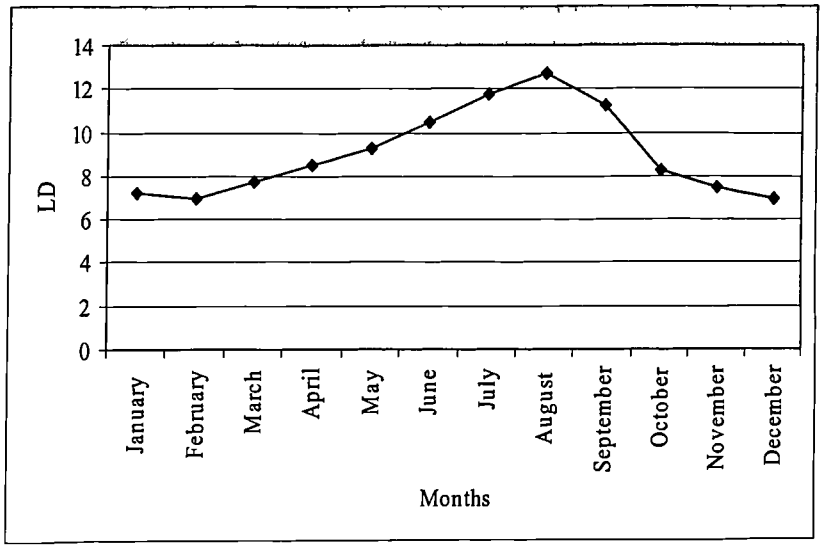
opened by the state between 1970 and 1993. Added to this, there were more than 660 small private firms producing construction building materials (General People's Committee for Industry (GPCI), 1993, p 8.). This reflects, on the one hand, the significance of the industry for the economy and, on the other hand, the extent to which the state intervened in construction and the building industry (as in other sectors).

Data from the 1960s shows that only around 20 per cent of building materials were produced locally, and the rest were imported (Stroller, 1962). In 2002, according to the report of the Research Centre for Building Materials and Construction (RCBMC) (2002, p.12), around 55 to 60 per cent of the national demand for construction materials was produced locally. The rest were imported. These figures reflect in general the development of and current conditions in the construction market in Libya.

At the time of study there were seven large cement plants in Libya. All were located on the northern coastal strip. Five were in the Tripoli region and two in the Benghazi region. The overall capacity of these plants is around 6.1 million tons annually. However, actual production averaged between 4 and 4.5 million tons between 1994 and 2002 (General People's Committee for Popular Broad Control (GPCPBC), 1998, P.21; Arabic Cement Company, 2004). These figures give an indication of the construction industry's reliance on cement products. This is supported by the review of drawings and bills of quantities of twenty-two building projects under construction in *Tripoli Shabia (municipality) in 2004.* The review reveals that the vast majority of construction items are based on cement and related products. Furthermore, according to 2000-3 data (RCBC 2000, 2001, 2002, 2003), the price of cement increases between March and October (see figure 4.13). This can be attributed to the increase in demand for cement, indicating that Libya's peak construction season falls between March and October (see figure 4-13).

However, several reports show that there is a gap between supply and demand for cement in the Libyan construction market (see figure 4-14). According to the Secretariat of Industry (2000, p.14), Libya's annual consumption of cement averaged between 6.5 and 7 million tons between 2001 and 2005, while actual domestic production was between 4 and 4.5 million tons.

Figure 4-13: Changes in cement prices (a 100 kilo) in the market in Tripoli city in 2003

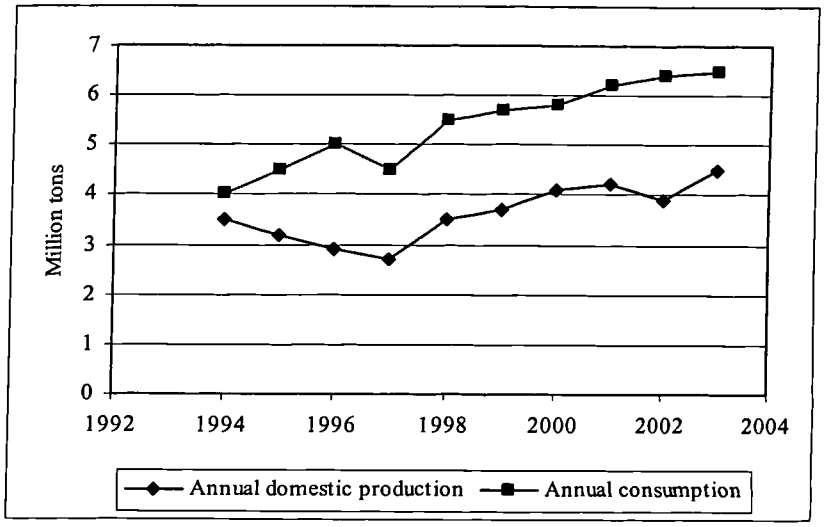


Sources: RCBC (2003), the Annual Report of the Prices of Building Materials in Libya's construction market (one LD = 1.42 US Dollar at the time of study)

Additionally, the final report of the technical committee regarding building materials for the housing sector (GCH 1995, p.5) indicated that the annual shortage in cement supply is between 2.5 and 3.0 million tons (see figure 4.14).This is confirmed by a report of the Ministry of Planning (2001, p. 68) which pointed out that the national production of cement and steel meets only 50 and 80 per cent respectively of annual national demand. The General People's Committee for Popular Broad Control (1998, p.22) has indicated that cement is sold on the black market, particularly during the peak construction season. The report also expected that the shortage in cement would increase in the coming years to reach around 3 million tons by the end of 2005 (see figure 4.14).

From the data, it is clear that the LCI relies heavily on cement and related products, such as concrete and steel. Consequently, construction operations and their related activities will inevitably be restricted by shortages or irregular supplies of cement and steel. However, it is argued that the processing, manufacture and assembly of cement and cement based materials on construction sites likely require many workers and levels of embodied water (to produce and cure one cubic meter of concrete takes between 300 and 350 litres of water in Libya).

Figure 4-14: Gap between supply of and demand for cement between 1992 and 2004



Sources: Compiled and calculated from the General People's Committee for Popular Broad Control (1998), and the Arabic Company for Cement (2004).

Thus, as mentioned in chapter three, the issue of water and transportation should be considered as important factors which affect the operations of the LCI in terms of the management of limited national resources and cost. Many have criticized the application of industrialized processes in developing countries. For example, Morel et al (2001, p.1119) argued that industrialized building methods are inappropriate to the geographical, social and economic circumstances of developing countries because they are based on construction materials such as cement, steel and concrete which consume considerable energy and produce high levels of pollution. Also, Nogowi (2001,p.291) pointed out that, in most developing countries, the transformation from practices based on traditional knowledge to scientific and technological approaches was characterized by the improving exploitation of natural resources without showing any great concern for the impact on the environment and the basic components of ecosystems.

Therefore, it is argued that the total reliance of the production and operations processes of the LCI on cement might be considered as a definite weakness in the industry's planning, because Libya suffers from acute shortages in water in terms of quantity and quality, and cement-based operations are likely to consume much water and energy as well as requiring a large number of workers. Consequently, it seems that the issue of water would be raised as one of the factors which have affected (and are affecting)

the current and future operations of the LCI. However, the position and influence of water in the current operations of the LCI is empirically identified in the following chapters.

4.6.5 Supply Systems in the Construction Industry

The literature on the CI shows that the supply of construction services and products is influenced by the context where the industry operates, the nature of demand and the structure of the CI (see 2.5). As the literature suggests, construction services in Libya are delivered by formal and informal Libyan and foreign firms (see 2.3.4, 2.6.2, 4.6.1 and 4.6.2).

The supply systems in the LCI have experienced three periods of organizational change over the past three decades. During the years prior to 1978, the supply of construction products, resources and services was managed by both the private and the public sector. Between 1979 and 1988, supply channels were completely controlled by the public sector in terms of the production, distribution, pricing and importing of construction materials and equipment; and since 1988 the supply system has been characterized by the strong role of the state in the financing and ownership of construction products and in the production and distribution of basic construction materials such as cement and steel, while construction building materials, labour and other services have been organized by the foreign and domestic private sector.

However, land for construction is generally supplied by the state and the informal land market. Furthermore, shortages in land for construction are one of the main obstacles restricting the operations of clients of construction projects and those companies investing in buildings and the housing sector (Abo-Gara, 1998, GCH, 1999, P.19; 2000, P.31; GCP, 2002B, P.29). The tribal land system affects the affordability of building land and the selection of construction sites. Also, laws relating to land acquisition in urban areas further restrict the supply of land for construction purposes (see 3.4.3).

Thus, it is argued that the current supply system is one of the key factors which affect the operations of the LCI. This issue is empirically explored in the following chapters.

4.7 Qualification, Training and Research in Construction

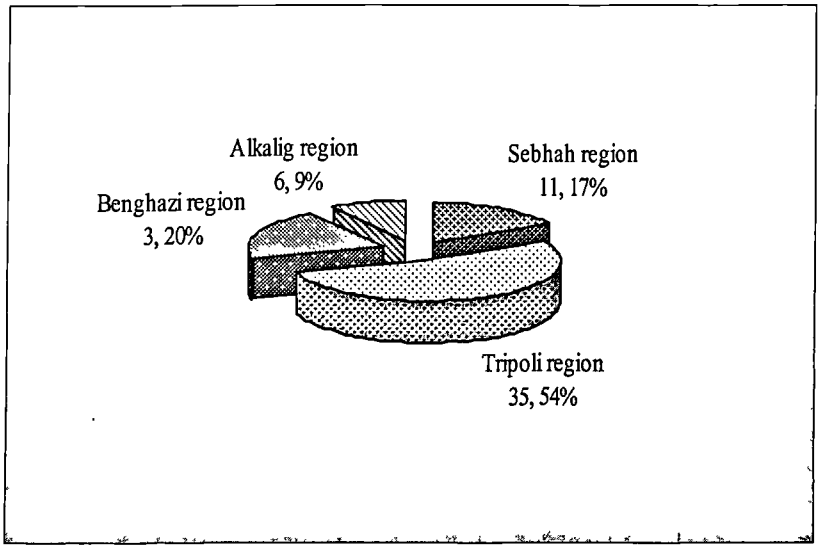
According the annual report of the National Corporation for Information and Documentation (NCID, 1999, p.120), only one per cent of the population was educated during the Italian occupation (1911-1943). However, in 1999 more than 37 per cent of the total Libyan population were students. The report also indicated that engineering education has a high reputation among Libyans.

The 1960s witnessed the commencement of a formal engineering education system in Libya when the Libyan University was established in 1962. Subsequently, the 1970s and 1980s saw an increase in the number of universities, departments and institutions as well as students involved in construction and its related activities in terms of planning, design, construction and management (General People's Committee for Planning, 1986, p. 80-81). As a result, the number of Libyan engineers, technicians, surveyors and assistants to engineers has increased remarkably. For instance, at the time of the present study, there were a large number of universities, institutions, faculties and departments concerned with qualification and training in construction. According to the Secretary of the Association for Engineers in Tripoli Shabia (Almarzuky, 2004), there are more than 12,000 engineers and around 14,500 assistant engineers in Libya. These figures reflect a remarkable increase in the number of qualified professionals concerned with construction in Libya.

According to the General People's Committee of Workforce, Training and Operation (GPCWTO, 2004, p.1-3), there are 65 government training centres in construction and its related activities. These provide training schedules including all skills related to the CI. Figure 4.15 shows the distribution of training centres. As can be seen in figure 4.15, 45 per cent (35 centres) of the total are in the Tripoli region, 20 per cent (13 centres) are in Benghazi, 9 per cent (6 centres) are in the Al-kalig region, and 17 per cent (11 centres) are in the Sebhah region. Added to this, in the first half of 2004 there were 64,757 trainers involved in different vocational training courses, 12.8 per cent of whom were engaged in training courses related to construction and its associated activities. The above figures imply that the state has given close attention to training issues in construction.

However, a report of the GCP (2002a, p. 14) indicated that the acute national shortage of construction workers has been the major reason behind the heavy reliance of the state, the LCI and private built-owners on foreign construction firms and workers. The report attributed this to the unwillingness of Libyan youths to work in construction sites after they have finished their training courses.

Figure 4-15: Geographical distribution of training centres in construction



Source: Compiled from the General People's Committee of Workforce, Training and Operation (2004)

As mentioned in the introduction to this study (see 1.2.1), the LCI is an under-researched area. There was an acute shortage of major research relevant to the LCI at the time of this study. Three main research institutions are concerned with research and development efforts for the LCI (see 4.4.2). Added to this, there are research centres at universities and development departments in most Ministries and firms. Unfortunately, a review of the small number of research studies conducted by these institutions reveals that no key studies have been conducted of the LCI and its key aspects. This shortage can be attributed, in general, to the low productivity of Libyan researchers. Also, the LCI is fragmented among a large number of government departments, as discussed in section 4.4.2.

In short, the number of engineers and technicians in the CI Libya has increased over the past three decades. The issue of training in construction is empirically investigated in the following chapters.

4.8 Summary and Conclusion

This chapter has shown that there have been two main phases of development and changes in the LCI and its associated processes and operations. In the first phase, indigenous construction activities were guided by clients and relied on builders and local construction resources (as in most other traditional societies). Furthermore, evidence was provided that traditional construction operations were based and organized around dry construction materials and methods. As a consequence, it seems that relatively very low levels of water were used in traditional construction operations and production processes.

In the second phase of the course of development of the LCI, crucial changes to the operations and production processes of traditional construction activities occurred since the mid 1950s in terms of the nature of construction materials, production processes and organization of the key operatives. Industrialized construction methods have become dominant. These rely heavily on cement and concrete technology.

Section three discussed the evolution and development of the modern construction industry in Libya. It showed that there is a strong relationship between the emergence of the LCI and political circumstances. The historical development of the LCI was divided into three phases. The development and the general characteristics of the CI in these three phases were discussed and documented. The influence of political ideology, labour, the informal sector, and cement on the organization and operations of the LCI emerged as the key issues which should be investigated empirically in the following chapters.

In section four, the current legal and institutional framework of the LCI was reviewed. It was concluded that the CI is regulated in accordance with socialist laws under partnership and public ownership principles. Furthermore, the state has a dominant role in terms of the regulation and management of the industry. The section confirmed that the influence of political ideology, the foreign workforce and companies and the ownership structure should be investigated empirically in the following chapters.

Section five reviewed the current scope and role of the LCI in the economy, employment and the development process. Despite the industry having a leading role in social and economic development in Libya, Libyans workers are under-represented in the industry. This issue is subject to investigation during the empirical study. In section six, the current structure and organization of the LCI was reviewed and documented. The industry

comprises the building and civil engineering industry (as in other countries). It comprises three important sub-sectors: the construction sector, consulting sector and the construction and building materials industry. Firms' and projects' features and resources emerged as one of the aspects which require more empirical investigation. Moreover, it was concluded that the operations of the LCI are concentrated in the northern regions (Tripoli, Benghazi and Alkaleg), and the Tripoli region is the largest construction market in terms of number of firms, projects and educated actors. Furthermore, the operations of the LCI are closely associated with cement production and distribution, and the peak construction season in Libya falls between March and October. Cement and water have emerged as two key issues. These are investigated empirically in the following chapters.

Section seven provided a brief review of the qualifications, training and research efforts relevant to construction. Libya has succeeded in increasing the numbers of managerial and professional staff in the construction field. However, in spite of these efforts, the operations of the LCI still rely heavily on foreign construction workers. It was also confirmed that the LCI is an under-researched area. The empirical research investigates this issue by identifying the general characteristics of the staff and operators in the CI.

The preceding chapters enabled the theoretical foundation of the study to be established, the topic of the study to be put in its geographical, social, economic and historical context. Therefore, the research methodology and the empirical study are developed and discussed in detail in the following chapter.

Chapter Five

5 Research Methodology and Process

5.1 Introduction

The aim of this chapter is to describe and discuss in detail the research methodology of this study and the research process. In this context, the chapter includes detailed discussions and descriptions of the process of developing the research methodology and designing and conducting the empirical research. In addition, it provides a detailed description of the techniques of sampling, methods of data collection, the procedures followed in conducting the survey, analysis of data and the limitation of the study.

The chapter is structured into three main sections. The first section deals with the issues of developing the research methodology; the second section describes and discusses the design of the empirical research; and the third section reports on the process of conducting the survey and its associated limitations.

5.2 Development of the Research Methodology

In the first part of this thesis, the topic of the study was put in its context. Therefore, the outcomes of the preceding chapters enable the study to be put in an appropriate methodological and analytical framework. According to Hart (2003, p.28) the term methodology is:

> "A system of methods and rules to facilitate the collection and analysis of data. It provides the starting point for choosing an approach made up of theories, ideas, concepts and definitions of the topic; therefore the basis of a critical activity consisting of making choices about the nature and character of the social world".

Billings (2004, p.13) tells us that a research methodology consists of impersonal rules and procedures to collect and analyse data, and it can apply to all research. In the following sections, the development of the methodology of this study is discussed and explained.

5.2.1 Establishing the Methodological Framework

The first step towards developing the research methodology was to establish a methodological framework for the study. In seeking this framework a set of questions were

formed. Table 5-1 shows the key questions in developing the methodological framework of this study.

Table 5-1: Research methodology questions

1. What is the appropriate research methodology to gain a better understanding of the CI in Libya?
2. What is the most appropriate way of investigating and analysing its key issues, aspects and indicators?
3. What are the sources on data of the LCI?
4. To what extent can access to this data be gained?
5. What kind of data, information and evidence need to be collected?
6. What is the most appropriate way of selecting the context for the study and a representative sample?
7. How, where and when can the LCI be investigated?

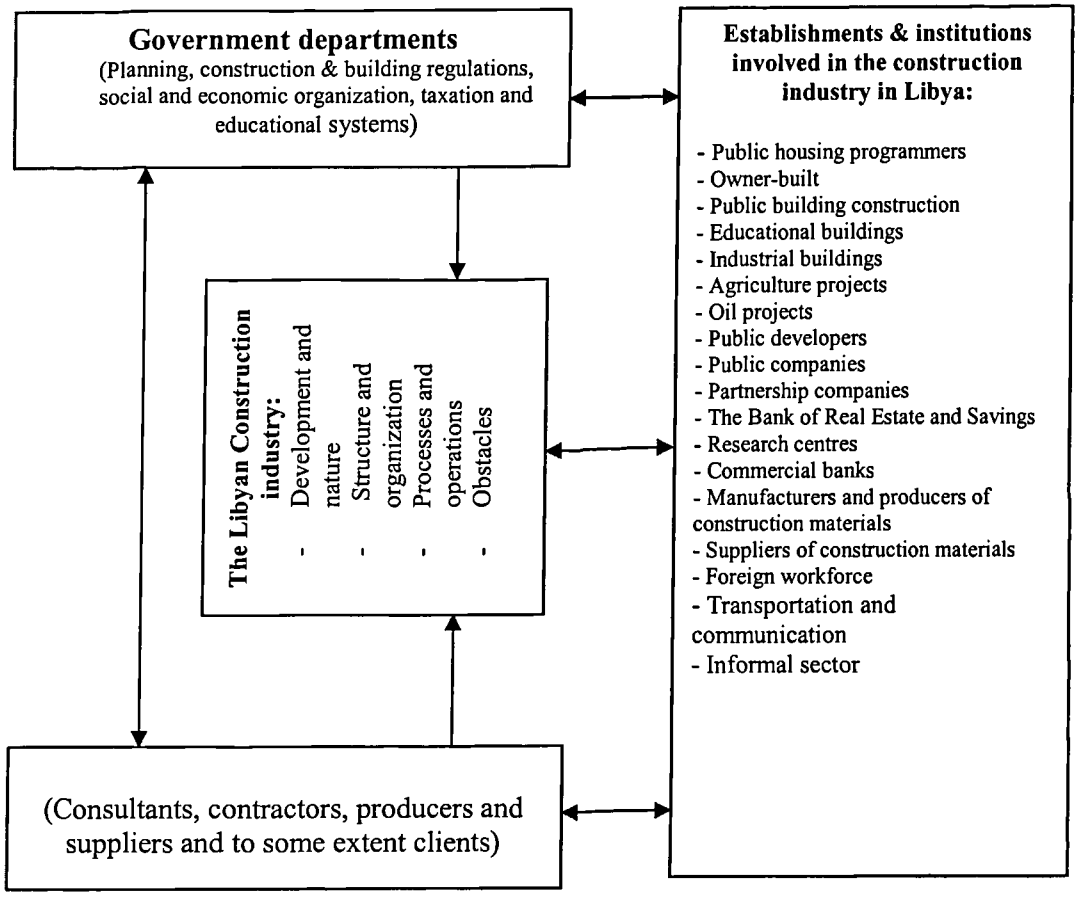
It was believed that the best approach for investigating the LCI and its associated processes and operations was to design the study around a methodology comprised of both theoretical and empirical approaches (see figure 1-2). The theoretical approach is based on a review of relevant literature, and gives an overview, discussion and analysis of the CI and its the key issues and aspects. The empirical approach explored the real life practices and operations of the LCI in a particular context (Tripoli city). In this sense, the major data and information were likely to be collected from the following sources: key actors[11]; clients[12], consultants[13] and construction firms[14]; decision makers, researchers, academics, site managers, producers and suppliers and other participants in the whole construction process.

5.2.2 Identifying the Key Components of the Construction Industry

In order to explore and understand the LCI, it was helpful to identify its key components. From the preceding chapters, it is clear that the CI consists of government departments, consultants, contractors, producers or suppliers and to a lesser extent clients. Also, several establishments and institutions have direct and indirect influences on the CI and its associated processes and operations, as outlined in chapter two. Figure 5-1 illustrates the key components of the LCI.

[11] The term key actors in this study refers to clients, consultants and contractors.
[12] The word client in this study indicates private and public owners of construction projects
[13].Consultants firms in this study refer to any organizations and engineering offices performing engineering works according to the regulations of the General Association for Engineers in Libya. These include Libyan and foreign firms.
[14] Construction firms in this study refer to any organisation performing construction activities in the formal sector. These include Libyan, foreign firms and joint ventures which were registered in the commercial registration office of the People's Committee of Economy and Trade, and they are in the formal construction sector.

Figure 5-1: Key components of the Libyan construction industry

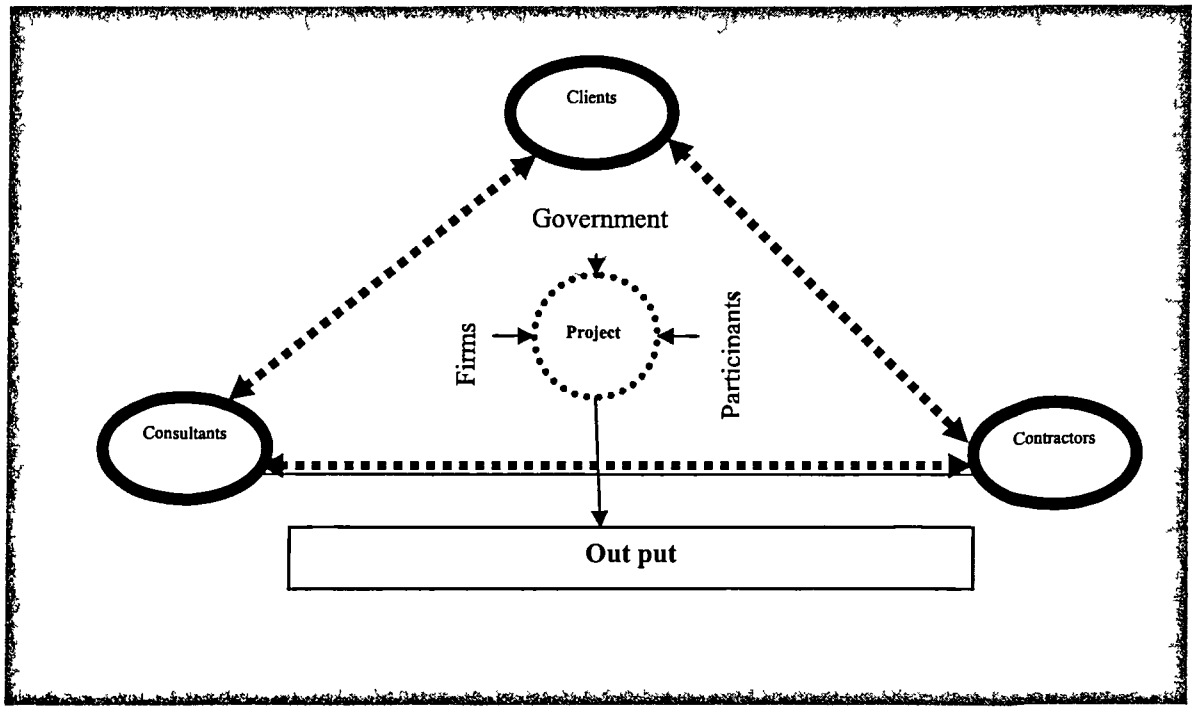


It was concluded that to gain a full understanding of how the LCI is developed, regulated and organized, what its practices are, what external and internal factors have formed (and are forming) its current status and shape, and what major obstacles restrict its operations, it was essential to investigate firstly the geographical and physical built environment where it operates, secondly contractors, consultants and clients, thirdly decision makers, site managers, academics, researchers, producers and suppliers. Thus, these groups would be the main sources of data about the LCI and its operations.

As discussed in section 2.5, the CI is based on construction projects, and its operations are organized around them. In this sense, the general characteristics of the CI and its associated structure, processes and operations are determined significantly by the characteristics of projects in terms of type, size, location and procurement systems. Furthermore, the construction technology and methods, equipment and labour to be used also depend on the nature of the project (see 5.2.1 and 5.2.2). It was concluded that projects are viable and renewable sources of data and information regarding the CI and its

key issues and aspects (see 2.5.1). Therefore, asking clients, consultants and contractors about their experiences in their last five construction projects and others concerned with the organization and operations of the LCI would provide vital data regarding the practices and operations of the CI in Libya. Analysis of this primary data was thought capable of providing a full picture regarding the general features of the CI in Libya. Figure 5.2 presents graphically the key sources of data and information.

Figure 5-2 Key source of information of the LC1



Furthermore, it was concluded that to build up a full picture of the LCI, the role, features and resources of firms are an important issue which should be explored. Consequently, gathering data and information about consultants and construction firms in the LCI was also thought an essential task in understanding the general characteristics, issues and aspects of the CI and major obstacles constraining its operations (see figure 5.2).

5.2.3 Defining Key Issues of the Construction Industry

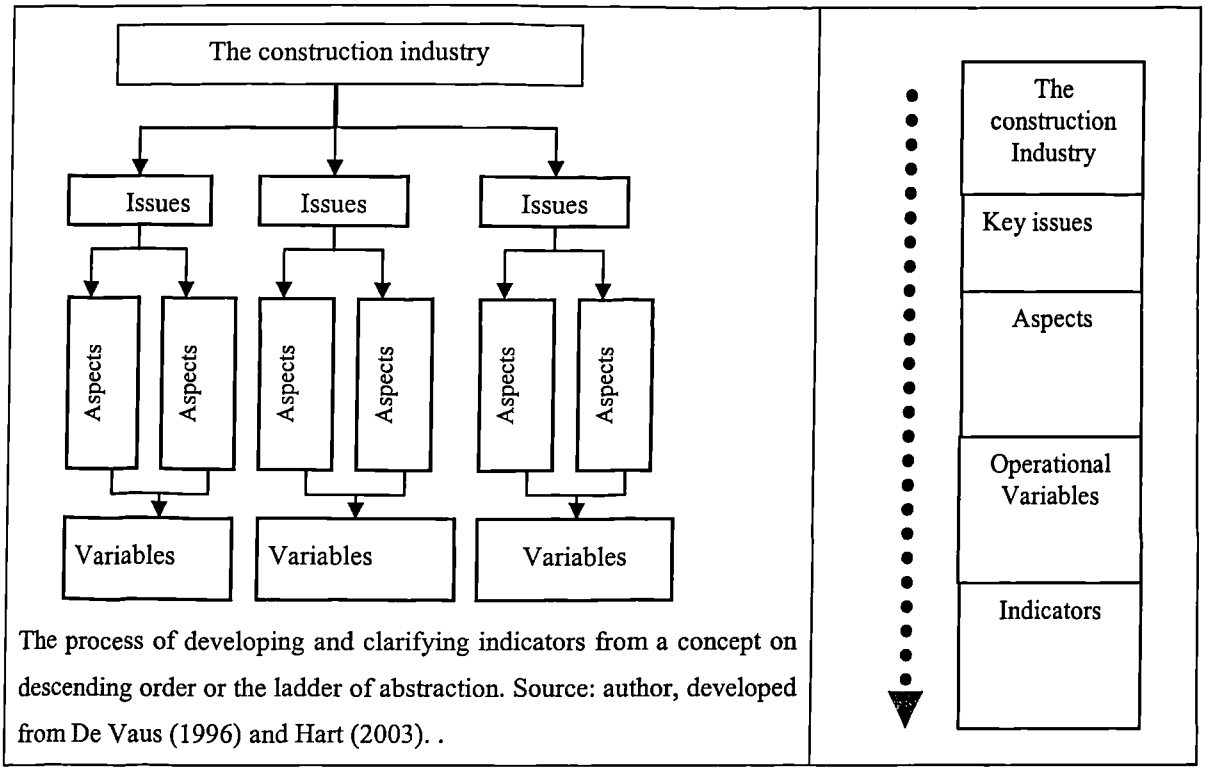
Based on the model of the CI in section 2.9 and figure 2.2, it was realised that to simplify the process of collecting and analysing data, as well as for the discussion and categorization of the findings of the empirical research, the CI would be analyzed in terms of key issues and aspects. In this context, Turin (1980b, p.276) stressed that the ultimate complexity of the CI means that any researcher interested in analyzing it must focus his concern on one sector or one aspect of the construction process.

In the preceding section, the CI has been categorised into three key components (see figure 5.1). In this section an attempt is made to go further in the process of analysis and simplification. Therefore, in general terms, it is argued that the CI consists of a set of issues and aspects. Each issue comprises independent and dependent indicators or variables. It is believed that, by investigating and analysing these issues and their association with each other, a fuller understanding of the LCI and its real life practices and operations can be gained. In this sense, Smith (1991, p.58) argued that, "the first step to creating testable research is to learn how to construct variables from concepts". De Vaus (1990, p.58) went further and stated that, "the development and use of both concepts and indicators is a process: It begins before data collection and continues during analysis. It is not till we write up the research and try to make sense of the results that we find out how we should have done it". These statements underpin the approach taken in considering the process of defining research issues and variables as an important step in developing a research methodology.

Hart (2003, p.151) argued that major topics (such as the CI) can be analyzed into sub-themes. According to De Vaus (1996, p. 50-51), this process of analysis is known as "the ladder of abstraction", and is based on breaking down broad concepts into clear and specific issues, aspects and variables. In other words, from the complex abstract to operational and testable issues and variables, this process helps in focusing the research and guiding the type of data and information to be collected (see figure 5.3). Therefore, based on the background of the discussion in the preceding chapters and the model of the CI in figure 2.2, the LCI was analysed in terms of its main issues; each issue comprises of several aspects and indicators or variables. The process of analysis is presented graphically in figures 5.3 and 5.4

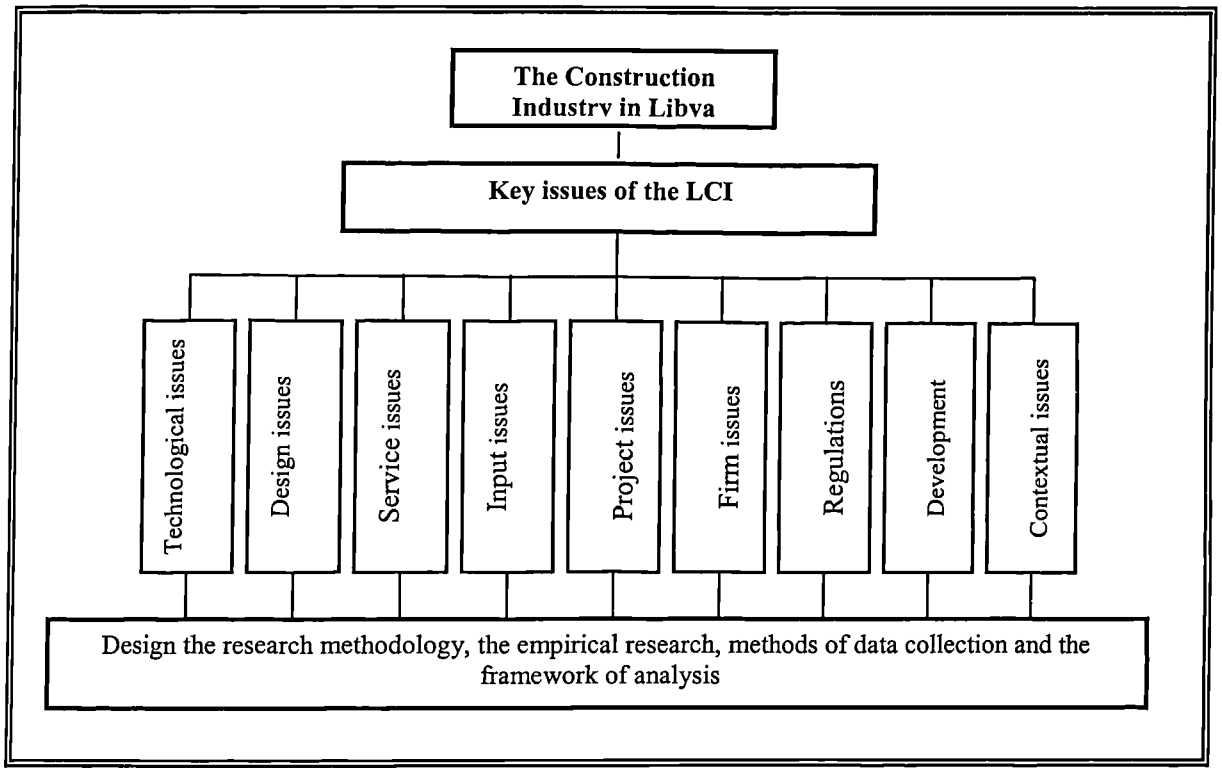
As can be seen in figure 5.4, the LCI was analysed into nine main issues: 1. Contextual issues, which comprise of geographical, political, social, and economic issues; 2. Development issues; 3. Regulation or restriction issues; 4. Project issues; 5. Firm issues, 6. Input or sources issues; 7. Services issues; 8. Design issues; and 9. Technological issues (see figure 2.2).

Figure 5-3: Process of analysing the concept of the CI into issues



The process of developing and clarifying indicators from a concept on descending order or the ladder of abstraction. Source: author, developed from De Vaus (1996) and Hart (2003). .

Figure 5-4: Key issues of Libya's construction industry (see figure 2.2)



Each of the above issues or indicators consists of several aspects and independent variables. It was believed that exploring those key issues would enable a full picture of the

LCI to be built up. However, owing to time and cost constraints, this study was focused on the contextual, firms and projects issues. Thus, it may become clear that, in this study, the process of defining the key issues of the LCI was an important step in the whole research process. In addition, it enabled the methodology of the study to be designed. In addition, it guides the analysis in subsequent chapters.

From the above, four main aspects will be explored: 1 the general characteristic of the CI in Libya; 2. the general features of key actors and firms of the LCI; 3. the key characteristics of construction projects and their associated procurement methods; and 4, the major obstacles constraining the operations the LCI.

5.3 Methodology of the Study

Based on the research strategy in section 1.2.3 and the discussion and analysis in the preceding sections, the methodology of this study comprises of two main approaches; theoretical and empirical (see figure 1.2).

5.3.1 The Theoretical Approach

Hakim (1987, p.3) pointed out that the aim of theoretical research is to produce knowledge for understanding and action. Yin (2003, p.9) stated that "a literature review is a means to an end and not an end itself". Hart (2003, p.27) indicated that the literature review enables the researcher to put the subject of the study in its historical context; to recognise the major studies in the topic and the key authors and references in the field, helping him to become familiar with the research context and what has been done and where the gaps are in the area of the study. Consequently, the main objective of the theoretical research in this study was to conduct a comprehensive review of available secondary materials with relevance to the topic of the study and its related issues. The theoretical research relied upon previous studies of the CI in general, with a focus on the CI of developing countries.

The outcome of the theoretical research enabled the theoretical framework to be built up, put the topic in its research context and identified its key issues and aspects as well as providing an understanding of the methodologies relevant to the topic. In addition, it provided the study with the basic theories, concepts, terms and vocabularies; giving a better understanding of the possibilities of the analysis and synthesis of the components of the CI. From the theoretical research it was possible to create operational definitions for

the CI, to build up a model of the CI, and to define the current trends in the CI and its associated processes and operations according to the latest information in the relevant literature. Finally, the research methodology and the empirical research could be designed.

5.3.2 The Empirical Approach

The second approach in the methodology of the study was the empirical research. Since there were no prior major studies in the field of study, the empirical research occupied an important place in the whole research process of this study. Its main objective was to explore the real life practices and operations of the LCI. Therefore, it was designed, firstly, to apply the research strategy and methodology to the context of the study (Tripoli city); secondly, to collect quantitative and qualitative data relating to the LCI; and thirdly, to address the research objectives (see figure 1-2).

In this context, the term 'empirical research' in this study refers to all research activities relevant to collecting primary data and the process of planning and designing the fieldwork, as well as to all the procedures of conducting the survey and other research activities in the city of Tripoli. In this sense, it comprises the design of the survey strategy, choice of the context for the study, conducting the pilot study, developing methods of data collection and technique of analysis. Furthermore, it includes the choice of sources of data, design of questionnaires, interviews, spreadsheet descriptions and other supportive methods and techniques such as observations, the visual survey, and visits to samples of firms and projects and informal interviews. In addition, it incorporates organising the key issues and aspects of the research and analysing the data collected (see appendix C). The following section introduces the empirical research of this study.

5.4 Planning of the Empirical Research

The design of the empirical research of this study was based on the outcome of the first part of this thesis, feedback from the early fieldwork trips to Libya, the consequences of the pilot study and the researcher's previous experience.

5.4.1 Empirical Research Strategy

The strategy of the empirical research was guided by the research questions, aims and objectives, and was designed according to the following criteria:

1. The area of study lacks primary and secondary data and information

2. The empirical research was conducted in phases.

The reasons behind this decision were as follows. Firstly, it enabled the strategy and methodology to be developed within the context of the study, and allowed more primary and secondary data to be collected, and formal and informal interviews to be conducted, as well as discussions and negotiations with actors, government departments and participants relevant to the topic of the study to be held before conducting the main fieldwork. Secondly, it allowed institutional and economic changes in the country to be considered and taken into account (see 3.4.1, 3.4.2 and 3.6.2). Thirdly, the strategy offered a great opportunity to fill any gaps which might appear during the process of data collection.

Therefore, the empirical research was conducted in four stages during fieldwork trips to Libya. These trips were carried out between November 2002 and May 2004. Table 5-2 shows the phases and objectives of each phase.

Table 5-2: Phases of the empirical research

The empirical research			
First field trip November 2002	Second field trip May 2003	Third field trip November 2003	Fourth field- trip February to May 2004
• Preliminary investigation of The construction environment • Determine the research scope	• Visual survey • Visiting factories, construction firms and construction projects. • Conducting informal interviews	• Pilot study • *Gathering* secondary data; reports, censuses and annual reports	• Main survey *(quantitative and* qualitative research)

As shown in the above table, the first phase of the fieldwork was a trip to the research context in Libya, carried out in November 2002; its main objective was to conduct a preliminary exploration of the construction environment in order to identify the general state of the LCI and the scope of the study (see 1.2.3). The second fieldwork trip was conducted in May 2003, aiming at conducting a visual survey of the operations of the CI and the physical *construction environment of Tripoli city. In addition during this trip a* sample of consultants, construction firms and construction projects under construction in

Tripoli city (the location of the study) and its vicinity were visited. Furthermore, several public and private manufacturers were also visited which produced construction materials (cement, clay brick, prefabricated buildings, etc.) and other producers and suppliers of construction materials (natural blocks, cement bricks, building, sand and aggregates). In addition, a set of informal interviews were undertaken with owners and workers in these plants and manufacturers. These visits included both the formal and informal sector. The third fieldwork trip was made in November 2003 in which the pilot study was conducted and a sample similar to that of the main survey was investigated. Finally, the fourth fieldwork trip (the major phase of the empirical research) was made between February and May 2004; its main objective was to carry out the main empirical research of the study. The activities of these phases are explained in more detail in the following sections.

5.4.2 Data Collection Strategy

Data collection strategy in this study comprises planning the survey, designing questionnaires, interviews, and other supportive techniques. These included written documents, descriptions, and minutes of formal and informal interviews, meetings, and broad range of written materials, reports, and photographs. Owing to the fragmentation and shortage of data and information relevant to the topic of the study (see chapter four), a triangulation approach was adopted. As a result, a blend of methods was employed to collect data from different perspectives. This strengthens the validity of the data and helps in overcoming problems of bias (Kane, 1990, p.52; Love et al, 2002).

From the previous experience of the researcher, the field visits, and the feedback from the pilot study, it was apparent that in general the structure of the LCI is comprised of small and medium firms in terms of numbers of employees and workload. As a result, the investigation included all units and firms involved in the activities of the CI.

5.4.3 The Location of the Study

Owing to geographical, historical, social, economic, administrative, technical and operational factors, Tripoli city was selected as a context for the study (see chapter one). The term 'Tripoli city' in this study refers to the Tripoli Shabia. In general, the choice of location was structured around two key objectives:

1. To answer 'how' and 'what' questions in the context of the city of Tripoli (see table 1.1 and 1.2.3), and in addition to identify key issues and factors which have shaped (and are shaping) the LCI within the real life context of the Tripoli city.
2. To formulate an appropriate body of knowledge enabling the description, understanding and analysis of the relationship between the key issues and aspects of the industry, as well as to identify the key obstacles constraining the operation of the LCI, to draw up conclusions and make recommendations for further research.

Tripoli City

The city of Tripoli is the capital of the country and is located in the centre of the Tripoli region. As mentioned in section 3.2.1, the Tripoli region has been the most important region in Libya in terms of the concentration of the population and social and economic activities. Recent statistical indicators show that the city has been and will be the largest and fastest growing urban city in the country in the coming decades. It is the largest built-up city in the country (www.nidaly.org, 2004). Furthermore, most government departments, establishments, public companies, factories and institutions as well as agricultural and industrial activities are centred around Tripoli city and its vicinity.

Throughout Libya's history, the city has played a significant historical, political and economic role (see.3.2.1, 3.5.1. and 4.3.1). Furthermore, at the time of the study, sixty two per cent of the total population of Libya was settled in this region, including sixty per cent of the total workforce in Libya, 42 per cent of construction firms and 56 per cent of consultancy firms were based in this region in 2004. In addition, 55 per cent of public construction projects in 2003 were located in the Tripoli region (see.3.2.1). These figures indicate, on the one hand, that the majority of construction activities and operations in Libya are aggregated in the Tripoli region in general and in Tripoli city in particular. This phenomenon exists in most developing countries where the CI is concentrated in central cities (Moavenzadeh et al, 1983, p. 19). On the other hand, Tripoli is an appropriate context for the study for the LCI and its associated operations, considering that the CI is regulated and managed by one central set of legal and institutional frameworks (see 4.4.1 and 4.4.2). Added to this, the context of Tripoli city provides the best example of the historical development and current operations of the CI in Libya.

It is important to explain why the study is concerned with the formal urban activities and operations of the CI in cities rather than in rural areas. This is mainly because, in developing countries, cities are predicted to play an important role in the coming decades (World Bank, 2000, p.14). As a result, the pressure on cities in terms of construction demand and supply will increase considerably. Tripoli is such a city. Added to this, in the Libyan context, the vast majority of Libya's population live in cities (see 3.2.1). Therefore, the vast majority of construction works will be concentrated in urban areas (see 3.5.3).

Based on the above circumstances, in can be said that the choice of this city as a context for the study was based on geographical, historical and demographic data and the social and economic role of the city in the country as well as current operational indicators of the CI in Libya. Furthermore, the researcher has extensive experience[15] and knowledge of the city and its administrative departments. Also, the city has been employed as a context in many studies in the past (Essayed, 1981; Daza, 1982; Grifa, 1997; Mukhtar, 1997; Shawesh, 2000; and many others). Of course, as discussed in chapter three, Libya is a large country in terms of area but small in terms of population. To focus the study on a particular city facilitated the management of the study in terms of time and effort.Thus, it was concluded that the city of Tripoli is a good location for investigating the CI and its associated processes and operations in Libya. This choice offers a suitable context in which the empirical research could be carried out. Therefore, the role of the city in national, social and economic activities, and the availability and variety of data and accessibility of their sources, made the city of Tripoli the best context for exploring the LCI and its associated processes, operations and obstacles.

5.5 Methods of Data Collection

The following methods were used to collect the empirical data.

5.5.1 Questionnaires

Since a significant part of this study was explanatory research, a questionnaire was an appropriate approach to collect quantitative data. According to Kane (1990, p.51),

[15] The researcher has studied and worked in the city for more than twenty-eight years; his work is directly related to the CI and its associated activities. In 1996, he carried out academic research in the city to gain his Masters degree in Architecture, and was the General Manager of the Research Centre for Building Materials and Construction in Libya, whose main administration is located in the city, and the nature of its daily work requires direct and indirect contact with actors in the construction and building sector in the city and the whole country.

questionnaires and interviews tell us what people say, do and think. Therefore, the questionnaire survey's main goal was to collect quantitative data regarding the real practices and operations of the LCI. In this context, it was designed to investigate the 'what' and 'how' questions of the study (see 1.3.2), and it targeted consultancy and construction firms, and the clients of construction projects. In order to obtain significant information, it was intended to administer the questionnaire to those persons who had senior managerial positions and had clear information about their firm and its past and current practices and operations.

Three questionnaires to consultants, construction firms and clients were designed, developed and tested before carrying out the actual survey (see appendix A). They were written in the English language, and then translated into Arabic; and were written in direct, clear and simple language, without technical jargon, in such a way that questions could be answered directly and quickly by the respondents. In order to increase the rate of response and to shorten response time and owing, in general, to the respondents' limited experience of dealing with such questions, most of the questions were in closed-ended format.

Based on feedback gained from the pilot study (see 5.5.6), suggestions and comments made by colleagues at Newcastle University, and two rounds of discussions with a team of Libyan specialists involved in design, construction and supervision activities in Libya, the questionnaires were revised and developed. Furthermore, the findings of the pilot study revealed that the face-to-face method was likely to be the best way to administer the questionnaire. It was believed that this method increases the response rate and creates opportunities to meet respondents. In addition, it allows informal discussions to be conducted with them. Moreover, it also gives the opportunity to explain unclear questions to respondents.

The three questionnaires were similar in terms of questions and structure. However, each questionnaire included a set of questions relevant to the respondent's background (see appendix A). In general, the questionnaires were structured into four main sections: background of respondent, characteristics of firms, issues of construction projects, and respondent's opinions and views regarding the LCI's issues and key obstacles.

5.5.2 Interviews

According to Peattie (1983, p.233),

> "The easiest way to understand how an industry works (the market in which it operates, the kinds of people who are active in it, the interconnection between firms, the difficulties of its operating, its connection to political processes) is through qualitative interviewing".

Many researchers argue that interviews are valuable methods for collecting data from the real world. Hakim (1987, p. 20) argues that "qualitative research is concerned with individuals' own accounts of their attitudes, motivations and behaviors. It offers richly descriptive reports of individuals' perceptions, altitudes, beliefs, views and feelings". Smith (1991, p.249) sees an interview as an attempt to extract information, opinions, or beliefs from a person. Interviews can be conducted by two main methods: with individuals and/or in group discussions. In this study, individual interviews were employed.

The interviews were semi-structured, and their main objective was to conduct supportive qualitative research. Therefore, questions were designed to clarify some of the aspects of the 'what', 'why' and 'how' questions of the study within the context of the study and to interpret the empirical findings of this study. The population targeted included decision makers, researchers, academics, recently graduated students, financers, and the producers and suppliers of construction materials. In addition, several supportive research activities were conducted in order to underpin and check the results of the study; these included a visual survey, visits to consultants and construction firms and construction projects under construction.

5.5.3 Observations

According to Robertson et al (1996, p.126), observational methods are one of the tactics used to collect data and information in the social sciences. Structured and participant observation are the main types of observation. In this study, indirect structured observation (where the aspects to be observed were decided before observation) was employed to collect data and information about the attitudes of actors, the general characteristics of consultancy and construction firms, construction materials and products, informal construction workers, producers and suppliers of construction materials and many other aspects.

There were many reasons underlying the use of observation as one of the key tactics for collecting data in this study. The most important was the acute shortage of documented data and information regarding the operations of the LCI. Added to this, the current researcher has extensive knowledge of the construction field within the context of Tripoli city. Therefore, throughout the different phases of the empirical study a range of observations were made and information was recorded. Consequently, a set of comments, remarks and suggestion based on the observations were recorded, and then some of these were discussed with those concerned with the CI and its associated activities and operations. Finally, during the analysis phase, the observed points were coded and cited. The most valuable observations were used to describe the LCI, as well as to discuss and interpret the findings of the empirical research.

5.5.4 Secondary Resources and Administrative Records

Throughout the study it is frequently mentioned that a lack of information was the major limitation which impeded the research process. Therefore, the analysis of secondary resources and administrative records were employed as one of the tactics for collecting quantitative and qualitative data. According to Hakim (1987, p.38), information from these sources can provide information about a topic which cannot be obtained by other methods. In addition, this process of collection and analysis is not expensive.

As a consequence, throughout the theoretical and empirical research in this study, a large number of documentary and administrative records relevant to the CI and its sub-sectors and activities were collected such as *government reports*, *statistical bulletins*, laws and regulations, housing and construction policies, annual reports of construction and consultancy firms, follow-up reports, diaries of site managers, letters, and many others. In addition, many electronic sites and sources were accessed and visited.

5.5.5 Other Supportive Techniques

It appeared that there were opportunities to employ a blend of supportive techniques to gather general data, information and evidence, such as informal interviews, as mentioned earlier, a visual and physical survey and reviewing the correspondence files of completed construction projects. Added to this, visits were organized and carried out to

a sample of consultancy and construction firms and projects as well as formal and informal manufacturers producing and supplying construction resources.

Furthermore, many informal interviews were undertaken with individuals and groups involved and interested in the CI in Libya. In addition, several rounds of informal discussions were held with colleagues in the General Council for Planning, the General People's Committee for Planning and the General People's Committee for Economics and Trade. Moreover, many photographs were taken of the physical built environment and the operations of the CI throughout all phases of the empirical research. Finally, letters of the correspondence from finished construction projects were investigated and checked, and comments, notes and sketches were made.

5.5.6 Pilot Study

According to De Vaus (1990, p.54), a pilot study is a necessary task in any research process; it enables the researcher to measure the reliability and validity of indicators (variables), before conducting the actual study. In this study, the pilot study was carried out between October and November 2003 in Tripoli city; it comprised questionnaires and interviews using a sample similar to that of the main survey. Therefore, thirty questionnaires were distributed to managers and directors of construction and consultancy firms and the clients of construction projects. In addition, five individual interviews were undertaken with decision makers, researchers, producers of building materials, suppliers and financers. Furthermore, during the pilot study a visual survey was carried out of the physical built environment (the physical output of the construction industry) of Tripoli city, and the operations of construction activities on site. In this sense, the built environment and operations of the CI were explored and documented photographically.

It was found that the pilot study was very valuable in revealing the level of constraints in gaining access to sources of data and information and in undertaking interviews with respondents. Furthermore, it allowed the application and examination of the research strategy and methodology in the context of the study to be tested. It also gave real insight into sources of data in terms of their availability and accessibility.

The data collected in the pilot study was analysed manually. The results showed that the following points should be taken into account before conducting the main survey:

1. Questionnaires:

1. Owing to the social and cultural characteristics of the context of the study, it was expected that large numbers of firms and clients could not be approached. Added to this, many respondents would be unwilling to participate in the survey or may provide unserious answers. This limitation had to be taken into account when determining the size of the sample. Therefore, it was essential to increase the size of the survey sample to gain sufficient data.
2. Face-to–face methods should be adopted to administer the questionnaire.
3. Respondents were unlikely to be interested in answering long questionnaires, and therefore they should be kept short. In addition, some respondents were unwilling to give all information owing, in part, to personal and cultural circumstances.
4. The questions should be in closed-ended format because respondents would not be used to dealing with open-ended questions.
5. The language used in the questionnaires and interviews should be as simple as possible, clear and direct. Colloquial words should be used to explain the meaning of technical words and concepts.
6. The structure of the questionnaires should be modified; some questions should be added and others deleted or amended.
7. Libyans are highly sensitive about giving information about their business, such as its size and turnover.
8. There was no clear sampling frame for the study; therefore, a sampling frame for the survey should be established.

2. Interviews:

1. Selection of interviewees should be carefully planned; particularly those working in government departments.
2. The time required for interviews should be as short as possible, and
3. Recording the interview was undesirable, owing to personal and cultural circumstances. Therefore, survey notebooks and summary sheets should be prepared before conducting the main survey.

While conducting the pilot study, the researcher attended the second session of the General Council for Planning which was convened between the 18th and 22nd October 2003. In that meeting, issues and policies relevant to housing, the CI and the workforce in

Libya were discussed. The researcher gave his views regarding those issues according to the present study's aims and objectives. The meeting was a good opportunity to meet, interview and hold discussions with many key figures among the Council's members about the study's aims and objectives.

5.6 The Process of Conducting the Survey

The survey was planned to be conducted in the spring season, when the weather was more suitable for conducting the fieldwork. Also, the construction season in Libya usually starts in March and extends until October each year (see chapter four).

5.6.1 Administrative Procedures

The researcher commenced the survey employing a set of administrative procedures. Therefore, the following steps were undertaken before starting the fieldwork. The researcher established an office in the centre of Tripoli which was equipped with good information and communication services such as computers, printers, a telephone and access to the internet. The office enabled the researcher to make the necessary contacts and arrangements relevant to the daily activities of the fieldwork. The second step was to obtain permission to carry out the survey. This permission was obtained from the General Peoples' Committee for Services Affairs (see appendix E), and it allowed the researcher to gain access to government departments, firms and several data sources. The third phase was to translate the survey documents, such as questionnaires and interviews, into the Arabic language. After consultation with linguists, some phrases and questions in the Arabic version of the questionnaires were reworded and amended in order to be consistent with the original English version. It is important to note that, owing to lack of an adequate vocabulary for translating some technical terms, colloquial words were some times used to explain them.

Because the survey was extensive, two assistants were trained in order to help administer the questionnaires. The selection of the two assistants was based on their work background; both were well known to the researcher, and had been working in the Research Centre for Building Materials and Construction of Libya. As a result, they had a wide experience and knowledge of the CI and its related departments and institutions in the country. The researcher explained to the assistants the aims and objectives of the study, the questions of the questionnaire and techniques of contact and communication. Furthermore,

advice and recommendations in terms of contacting targeted firms, communicating and dealing with respondents, and checking the completed questionnaires were given to the assistants. To ensure that the two assistants had gained the required skills and abilities to administer the questionnaires, a pilot survey was conducted in which a similar sample to the actual sample of the survey was used. Each assistant administered seven questionnaires to senior managers or directors of consultants and construction firms and clients of construction projects. Based on the results of the test survey, the researcher prepared a further list of instructions, advice and recommendations in the Arabic language; this list was used as guidelines for the survey. In addition, the assistants were trained to record comments and remarks in the survey notebook.

5.6.2 Sampling

Social scientists use many different sampling strategies to find a representative sample. There are different types of sampling techniques. In general, the determination of a sampling technique depends on two factors: the degree of accuracy required in the study and the cost (Smith, 1991, p.146). In this study, the sample was based on the need to avoid a biased sample[16], the time available for the study and the circumstances of the context of the study.

5.6.3 Sampling Methods

In this study, two methods of sampling were adopted; the random and snowball-sampling methods. The principles of random sampling were employed to select a representative sample for the questionnaire survey. In this method, any case (firm, unit or organization) in the sampling frame has an equal probability of being selected. This was employed owing to a number of reasons. The key reason related to the belief that to gain a better understanding of LCI, it was essential to generalise the sample by giving an opportunity for any formal firm, unit or organization of the industry to take part in the survey. According to Gardner (1978, p.89), "the only way in which we can obtain a sample which is representative in all respects is to use some form of random sampling". Thus, a representative sample of consultancy and construction firms was based on the principles of random sampling.

[16] Smith (1991, p.146) defines a biased sample as a "sample in which the working universe is not accurately or fairly represented".

However, the snowball sampling method was adopted to derive a sample of clients' as well as interviewees respondents. In this method, the selection was based on choosing one respondent as a starting point and then asking him or her to recommend other suitable respondents (Robertson, 1996, p. 81). The reason underlying the use of this method was that it enabled the researcher to focus on those who had considerable experience or a close interest in the research topic (Hakim, 1987, p.142). The method by which the representative samples were drawn from the entire sample is explained in the following section.

5.6.4 Establishing the Sampling Frame

Considerable efforts were devoted to building up the sampling frame of the CI in Tripoli city. The researcher relied on recent lists and annual reports of the People's Committee of Economy and Trade (PCET) of Tripoli Shabia (municipality), and the General Association of Engineers in Libya (GAE). Therefore, according to the available data in March 2004, the sampling frame of construction and consultancy firms was established. Tables 5-3 and 5-4 explain the sampling frame.

Table 5-3: Sampling frame of construction firms in Tripoli city, March 2004

Type of firms	Number of firms	% of total
Public companies	9	2.4
The organization of Public Works	1	0.27
Domestic Partnership Companies	216	58.1
Cooperative family firms	57	15.3
Joint venture	3	0.81
Foreign companies	86	23.1
Total	372	100.0

Source: compiled from recent lists and reports of the General People's Committee of Economy and Trade of Tripoli Shabia (municipality) (PCETE, 2004).

Table 5-4: Sampling frame of consultancy firms in Tripoli city, March 2004

Type of consultancy firms	Number	%
Consultants firm	59	41.5
Engineering Offices	81	57.1
Public consultants firm	2	1.4
Total	142	100.0

Source: compiled from recent lists and reports of the General Association of Engineers of Libya (GAE, 2004).

A representative sample of the clients of construction projects was established according to the criteria of the snowball method as mentioned in the preceding section. Based on the researcher's previous experience, feedback received from decision makers, the Department of Projects in Tripoli Shabia (municipality) and several public estate agencies, a list of thirty-two clients of private and public construction projects in Tripoli city was created; the list included names, addresses and in some cases telephone numbers of each client. This list was considered as a representative sample of the clients of construction projects in the city. In this regard, it is important to note that the majority of the clients of construction projects were public sector departments, as mentioned in chapter three.

5.6.5 Size of the Representative Sample

One hundred and fifty construction firms were selected randomly from the sampling frame of construction firms; this number represents 40.3 per cent of the cases of the total sampling frame in Tripoli city. Fifty-five consultancy firms were also selected from the sampling frame of consultancy firms, representing 38.7 per cent of consultancy firms in the city. It was intended to increase the size of sample in order to increase the response rates (see 5.5.6). Random numbers was used to select both samples from their sampling frames. Furthermore, thirty-two clients of construction projects were considered as a representative sample of clients of construction projects. In addition, a sample of thirty-nine interviewees was listed. Interviewees' experience, background and their current positions guided the selection process of the representative sample of interviewees (see table 5.5).

Table 5-5: Representative samples of the study

Sample	Sampling Frame	Method of selection	Representative sample	Method of Inquiry
Construction firms	372	Random	150	Questionnaire
Consultancy firms	142	Random	55	Questionnaire
Clients	32	Snowball	32	Questionnaire
Interviews	39	Snowball	39	Interviews

Generally, the sizes of the samples in this study were influenced by the purpose of the study, the availability of data, and the possibility of gaining access to sources of data. Also important were the time available for the study, the structure of the CI, and the backgrounds of respondents.

5.7 The Operation of the Survey

Having finished the administrative procedures and established the representative sample, the survey operation was started as follows:

5.7.1 Administering the Questionnaire Survey

The general goal was to administer 237 questionnaires to a representative sample of senior managers or directors of consultants and construction firms and clients of construction projects. The administration of questionnaires was undertaken in the mornings and evenings. The face to face method was employed to administer the questionnaires (see 5.5.6). Before administering the questionnaires, intensive contacts with the selected firms and clients were made by telephone and fax. Face to face contact was also made in arranging appointments with interviewees.

Firstly, the questionnaire was explained to the respondents to ensure that it was administered to the targeted person. In many cases, while the respondents were answering the questionnaire, the investigator was on hand to clarify any unclear questions. In some cases, unclear questions had to be phrased in the colloquial Libyan form of the Arabic language. In some cases, the respondents also took some time in order to check files and give answers. Therefore, in many cases, the questionnaire was left with the respondents to be answered later. This is mainly because *some questions needed time in order to review* files to extract information, such as those related to turnover, numbers of projects, workers and contracts, etc. As a result, an appointment was set up in order to collect the questionnaire. Consequently, it can be said that the responses came from documented sources, thus giving credibility to the data gathered. In addition, comments and remarks relevant to all issues of the investigation were documented in the survey notebook in parallel with the process of administering the questionnaires.

As mentioned previously, some firms were not interested in participating in the survey. This was possibly because the majority of Libyans are not used to dealing with researchers (see 5.5.6). In such cases the next firm in the sampling frame was contacted. In addition, it was noted that some questions were often ignored by respondents particularly those which were relevant to the annual turnover of the firms. This increased the number of discarded questionnaires . Furthermore, a list of comments were documented in the survey notebooks regarding respondents' attitudes towards the survey, the influence of social and cultural

factors on the survey's progress and findings, the effect of the personal appearance of the investigator on the mode of interaction with respondents, the characteristics of the language and speech of respondents, the body language used by respondents and many other comments. These points will be discussed later in this chapter (see 5.9).

With a view to achieving the objectives of the survey and to ensure that questionnaires had been completed successfully, they were checked at the end of each working day. In some cases, the researcher or his colleagues contacted respondents in order to encourage them to supply missing answers or to explain unclear answers. However, a large number of completed questionnaires still had to be discarded owing to missing data and non-serious responses. Then, each question was coded and numbered, responses were translated into numerical form, and then the data were entered into the computer database daily throughout the survey period. This process was useful in increasing the reliability of the data, as well as saving effort and time.

The first step in the survey was administering the questionnaire to construction firms, because a significant proportion of the representative sample for the survey consisted of them. It was believed that starting with this group would offer opportunities to visit construction firms and gather information about clients and consultancy firms, and particularly their addresses. It was intended to administer one hundred and fifty questionnaires to managers or directors of private and public medium and small construction firms. However, only one hundred and twenty firms were approached; since thirty construction firms could not be contacted owing to unclear addresses. This limitation had been expected (see 5.5.6). The administration of questionnaires was mostly conducted during working hours, mainly between 7.30 am and 2.30 pm, and in some cases during the evening, over an eight-week period. Owing to technical obstacles (changes of addresses), the survey was suspended for three days. The support of government departments, local government officials and friends contributed to overcoming this limitation. It should also be noted that, in some cases, respondents refused to participate and others lacked seriousness in their answers. However, in general most of the sample gave the questionnaire thoughtful consideration. At the end of the survey, one hundred and twenty questionnaires were administered.

Having conducted a considerable proportion of the construction questionnaire survey of construction firms, the consultancy firms' questionnaire was administered. The

majority of the questionnaires were administered during the evening; particularly between 4.00 pm and 7.00 pm. This was because a majority of the managers and directors of consultancy firms were government employees in the morning; they usually worked in consultancy firms and engineering offices as part time employees during evenings. It was originally planned to administer fifty-five questionnaires; however only forty-four questionnaires were administered. Eleven firms in the sample could not be contacted owing to ambiguities in their addresses. Because of the higher educational level of these respondents, the questionnaires were completed smoothly and without any major difficulties. Furthermore, informal interviews were conducted with some interviewees who showed particular interest in the subject of the study. At the end of the survey, forty-four out of fifty-five questionnaires had been completed by respondents.

The questionnaire for the clients of construction projects was administered in the last phase of the survey. This was generally owing to difficulties in gaining access to respondents. The questionnaire was administered to one client of a construction project, and then this client was asked to recommend another client from the list of the clients of construction projects. The slow progress of this part of the questionnaire survey was owing to the difficulties in contacting and arranging appointments with respondents; particularly with clients in the public sector. Also, some clients refused to answer the questionnaire owing to their personal belief that answering would put them at risk. At the end of the survey, seventeen questionnaires were completed.

To conclude this section, it had been planned to administer 237 questionnaires. However, only 181 of these were administered. This was considered satisfactory and encouraging, particularly in a social and cultural context such as Libya (see appendix C). It should be mentioned that the survey was not free from serious limitations and difficulties. These are discussed later in this chapter (see 5.9).

5.7.2 Conducting the Interviews

The interviews were undertaken in parallel with the process of administering the questionnaire survey. The majority of interviews were conducted at the workplace, some were undertaken during the meeting of the first National Conference for Standardization which was held in March 2004 in Tripoli, and at the homes of interviewees (see 5.5.6). Furthermore, over the long days of the fieldwork, opportunities were found to undertake many informal interviews with many individuals and groups. In contrast with the

questionnaires, in all interviews the respondents tended to reply to all questions patiently and graciously. This is possibly because the current researcher had established a good working relationship with most of the interviewees owing to his work background (see 1.1).

Owing to personal, political and cultural circumstances, the researcher did not record the interviews. This may be considered as one of the limitations of this study. Therefore, to overcome these barriers, the responses were written down on a prepared interview schedule, some by the interviewees and some by the researcher. In what follows a brief outline will be provided about the interviews, and appendix A gives more detail about them and the questions asked.

In brief, it was planned to conduct eight interviews with decision makers[17]. However, only six formal interviews were undertaken owing to administrative reasons. The interviewees were senior decision makers with a high level of responsibility regarding national, regional and local planning and policies in direct and indirect connection to the CI and its associated operations at both central and local levels. Added to this, three interviews were conducted with experienced academics who had for more than twenty years been engaged in teaching and consulting activities as well as research in various issues and aspects of the CI. Only three of the planned four interviews were undertaken with researchers.[18] Questions were centred around the LCI, as well as research and development efforts relevant to the CI, and building regulations and specifications.

Furthermore, five interviews were conducted with the managers of projects under construction; table 5.6 lists these projects. In addition, numerous informal interviews were undertaken with other engineers on the projects' sites. Questions concerned issues for the construction projects, processes and operations, the supply of labour and materials, as well as the major obstacles constraining the operations of the CI. After these interviews, the

[17]The interviewees were working in the General Council for Planning, the People's Committee of Economy and Trade, and the General People's Committee for Popular Broad Control (Department of Contracts and Follow-Up) and others. Three of the six interviews were undertaken with the Under Secretaries of the General Council for Planning, the General People's Committee (Ministry) of Planning and The People's Committee of Economy and Trade, and the rest were conducted with key senior managers in the General People Committees.

.[18]They were working in the Research Centre for Building Materials and Construction, the Industrial Research Centre and the National Centre for Specifications and Standardisation; all of these centres are located in Tripoli city

project managers and the present researcher[19] held a walking guided tour around the project workshop. Table 5.6 describes the construction projects that were visited and whose managers were interviewed:

Table 5-6: Managers of projects that were interviewed

Project	Construction company
Ameaitiga Project	Estate Investment Company
Al-Hadaba Asharkiya	Arabic United company
Suq -Atulata Al-Kadeem	Arabic United company
Suq -Atulata Al-Jadeed	Al-Tacheed Company
Taric Al-Mataar	Internal Investment Company

Despite the importance of the financial sector in its association with the CI, only two of the planned three interviews were undertaken with key figures in the financial sector in March 2004. The interviewees worked for the Alshara Commercial Bank and the Real Estate and Savings Bank, both located in Tripoli city. Questions were centred around issues and aspects relevant to financial services (see appendix A).

Furthermore, an interview survey[20] was conducted with a representative sample of seven students from the Architecture and Civil Engineering departments of Al-Fatah University in Tripoli city in April 2004. The students had finished their graduate projects in January 2004. Questions were focused on the definition and scope of the LCI, curricula, courses, student perceptions, and general opinions and views regarding the CI.

Six of nine planned interviews were undertaken with private and public producers[21] and suppliers[22] of construction materials in the formal and informal sectors (3 producers and 3 suppliers). These interviews were carried out in May 2003, during the third phase of the empirical research. Questions were focused around construction materials and components in terms of production, distribution, costs, supply, shortages, seasonal patterns of demand, and the prices of construction materials.

[19] The managers described and explained the different phases and operations of the projects. In addition, the researcher photographed important sights relevant to the operations in the project. Furthermore, minutes and comments were recorded regarding the different aspects of the projects.

[20] The interviews were based on a random sample in which seven interviewees were selected from the list of students.

[21] The interviews were conducted with managers, directors or owners of factories producing basic building materials such as cement, steel, clay bricks, cement block, floor tiles and natural blocks in Tripoli city. In addition, many informal interviews were also conducted with other producers.

[22] These interviews were conducted with individual distributors (traders) in Suq Al-Talata Market, Taaric Ahahash Uniee and Janzur in Tripoli city.

By the end of the interview survey, thirty-two out of the planned thirty-nine interviews were conducted, as well as numerous informal interviews having been conducted with various participants in the LCI. The results received from the interview survey were highly significant as qualitative data, information and evidence regarding the LCI and its associated processes and operations. As mentioned in section 5.5.2, these findings were employed to strengthen, check and underpin the empirical findings of the study.

5.7.3 Other Supportive Research Activities

In addition to the questionnaire and interviews, several other research activities were carried out. These were conducted in different phases of the empirical research. A brief outline of these techniques is given in the following sections.

1. The Visual Survey

The physical conditions of the built environment of the city of Tripoli were exploited as a source of information and evidence. The existing physical built environment of Tripoli is considered as the final products of the indigenous and contemporary construction industry throughout its history. It is believed that this offers significant information relevant to the historical development of the LCI and changes in its key actors, processes and operations. In addition, the use of photographs helped in understanding the general characteristics of the CI in the city, and underpinned the discussion and analysis in different chapters of the thesis. Visual data such as films and photographs are widely used by social scientists to illustrate discussions and findings. According to Plummer (2004, p.285), the most common use of photographs is as a documentation and descriptive tool. In addition, photographs are often utilized to explain a text. Another vital use of photographs is for "narrative visual theory". In this study, photographs are used to narrate the story of the development of the CI in Tripoli city in particular and in Libya in general, as reviewed and discussed in chapter four.

The visual survey was conducted in Tripoli city in May 2003; its main objective was to photograph and document the existing physical built environment of the city of Tripoli and the operations of the CI and its associated construction resources. To achieve these objectives two techniques were used; taking photographs and conducting informal interviews with older people (craftsmen and users). After obtaining the necessary permissions, the survey was conducted. For each area of the city, dozens of photographs

were taken. Subsequently, the collected photographs were classified in historical order. As a result, a visual narrative story was created for the development of the LCI in Tripoli city, divided into three sections; indigenous or traditional, colonial, and contemporary construction output (see appendix E). The information collected was used to describe and analyse the development of the CI in Tripoli city over the past decades and explore the changes in the organization, resources, processes and operations of construction in Libya, as well as to strengthen the empirical findings of the study relevant to the characteristics of the LCI in Tripoli city.

2. Visits

Another supportive research activity which was conducted in the second and third phase of the empirical survey was visiting selected samples of consultancy and construction firms and construction projects under operations, as well as factories producing construction materials in Tripoli city. The general objective was to gain a general insight into how firms and projects are organized, managed and operated in the real construction world. These visits enabled information regarding the company's history, legal status, management, organization, resources, main business activities, training aspects and other issues relevant to the questions of the empirical study to be gathered and confirmed.

Five public and private construction companies (two public and three domestic partnership firms) and two public consultancy firms were visited. The construction companies were involved in important construction projects in Tripoli city (see table 5-6). During these visits, a set of observations, several informal interviews and discussions with managers and directors of departments relevant to the projects, operations and production issues were conducted. These discussions and interviews were focused on aspects relevant to construction project such as design phases, the quality of project drawings and documents, construction processes and operations, supplies of materials, types of construction materials, labour and subcontracts. The responses were used to check and underpin some of the empirical findings of the questionnaire survey by comparing the results and observed conditions and attitudes.

2. Diaries and Letters

It appeared that the correspondence files of finished projects and the diaries of experienced site managers could offer significant data regarding firms and projects. In

addition, they are an important means of communication between all participants in the construction process. Therefore, one of the techniques for collecting data was to review the diaries of site managers and the correspondence files of finished construction projects owned by the Secretariat of Housing and Utilities of Tripoli Shabia (Municipality). Plummer (2004, p.284) stated that many facts and general opinions can be gained from letters and diaries. The contents of two diaries and three correspondence files were reviewed and analyzed. The information collected gave a general view of major obstacles facing the operations and processes, the progress of projects and the nature of information and communications processes in the LCI.

5.8 Analysis of Data

The collected data and information were reviewed, coded and processed by two methods of analysis (see 5.8.1, 5.8.2 and appendix C). The quantitative data was processed and analyzed using SPSS (Statistical Package for Social Science), and Excel software, this was used in the later stages of the study in order to present the study's findings and to compare the responses and opinions of contractors, consultants and clients. In addition, secondary data analysis was employed to re-analyse data available relevant to the CI and relevant economic sectors and its associated activities. The qualitative data was analyzed by content analysis in which key themes and categories were compiled from interviewees' replies in order to interpret general points (see appendix C and E) In the words of Bryman (1996, p.61) "the most fundamental characteristic of qualitative research is its express commitment to viewing events, actions, norms, values, etc., from the perspective of the people who are being asked". Furthermore, a combination of quantitative and qualitative findings enables the plausibility of the findings of the study to be determined and also the linkages between collected data and reported findings to be evaluated (Hammell, et. al.,2000, p.109).

Furthermore, in order to measure the reliability of the responses, The Weighted Average Score (WAS) and Average Weighted Responses (AWR) were calculated using the following two formulas:

1. The Weighted Average Score of Responses (WAS) $=\sum fx$ $(1 \leq AWR \leq 5)$ where f is the number of respondents, and x is the rating given by the respondents to each obstacle ranging from 1 to 5.

2. The Average Weighted Responses (AWR) $=\sum fx / N$ ($1 \leq AWR \leq 5$) where f is the number of respondents, x is the numerical number given to each factor by the respondents ranging from one to five, and N is the total the number of response cases.

Furthermore, analysis of variance (ANOVA) at the 5% significance level was undertaken to test the findings and identify whether the respondent groups' (clients, contractors and consultants) opinions and views regarding some variables and aspects of the LCI were similar. An ANOVA programme is available on SPSS. This test allows the findings of the survey to be tested statistically, clarifies the differences between the mean values of the survey sub-groups and finally, allows conclusions to be drawn. In addition, SWOT (strengths weaknesses, opportunities and threats) analysis is employed to identify the strengths and weaknesses of, opportunities for and threats to the LCI (see 8.5 and table 8.23).

Owing to the volume and variety of data gathered, and, from the past experience of the current researcher, it was identified that the vast majority of Libyan researchers lack knowledge of dealing with empirical data. Therefore, it was decided to devote appendix C to discussing the strategy for the analysis of the data adopted in this study and the processes of categorization of the findings of the study. It is believed that the discussion in appendix C will enable researchers to benefit from the analytical approaches used in this study. On the other hand it allows the discussion in the following chapters to be structured using a clear analytical framework in accordance with the research questions, aims and objectives, as will be explained in the following chapters.

5.8.1 Characteristics of Completed Questionnaires

To ensure questionnaire responses were in accordance with statistical standards, they were classified manually into four categories from the point of view of missing data and the quality of responses. These categories are: responded successfully or useable questionnaires; wrongly classified cases; discarded questionnaires and those cases who could not to be contacted or who did not respond, as table 5.7 explains.

The term 'responded successfully' means that all questions in the questionnaire were answered completely and precisely. The wrongly classified cases indicate those which did not conform to the questionnaire criteria (some firms were classified or registered as a construction or consultancy firm but in fact practiced different businesses). Discarded

questionnaires refer to those cases in which there were missing data (between 5 and 10 of the total questions were not answered; some firms were reluctant to answer questions relevant to annual turnover) or gave illogical or frivolous answers (where, for example, the respondents answered the questionnaire quickly and without serious thought and some firms probably adjusted their statements of annual turnover to match their tax declarations[23]).

Table 5-7: The characteristics of the completed questionnaires

The characteristics of completed questionnaires	Contractors n=150		Consultants n=55		Clients n=32	
	No.	%	No.	%	No.	%
Responded successfully	72	48	24	43	12	38
Wrong classification	9	6	7	13	-	-
Discarded cases	14	9	6	11	2	6
Could not contacted	30	20	11	20	15	47
Unwilling to participate	25	17	7	13	3	9
The representative sample	150	100	55	100	32	100

These cases may arise from lack of confidence and the uncertainty of the environment or unwillingness to give information. Firms could not be contacted owing, in general, to difficulties in obtaining the correct address; or some firms had closed down or amalgamated with other firms. Other cases agreed to participate in the survey (as a matter of courtesy), but did not answer the questionnaire precisely.

From the above, the unwillingness of respondents to give information, unserious answers, missing data and the inaccessibility of some firms in the representative sample led to many questionnaires being discarded. Such a situation was anticipated before conducting the survey (see 5.5.6 and 5.6.5) because of the political, social, cultural and bureaucratic context of the study.

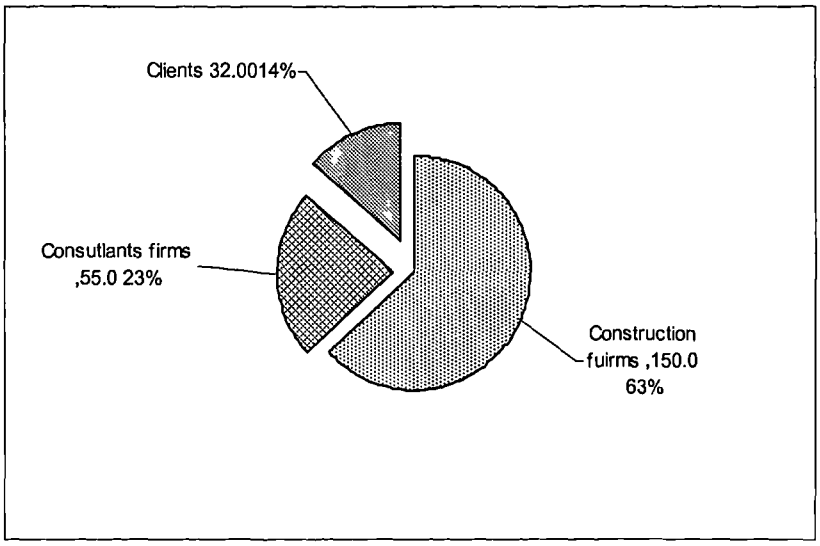
5.8.2 Profile of the Survey and Response Rates

Figure 5.5 shows the questionnaire survey sample. It was planned to administer 150 questionnaires to construction firms, including 6 (4%) public firms, 88 (59%) domestic partnership firms, 42 (28%) cooperative family firms, 12 (8%) foreign companies, and 2 (1%) joint venture companies. Out of 150 construction firms only 120 were contacted: 80 (66%) were domestic partnership firms, 6 (5%) public firms, 8 (7%) foreign firms, 24 (20%) cooperative family firms and 2 (2%) joint ventures. 30 firms could not be contacted

[23] A general manager in the Companies Department in Tripoli's Taxes Authority confirmed that a majority of the CI's firms did not provide accurate tax declarations regarding their annual turnovers.

owing to difficulties in obtaining the correct addresses; or firms had closed down or amalgamated with other firms (see table 5.7).

Figure 5-5: The sample of the questionnaire survey



The overall response rate of the construction firms' questionnaire was 80 per cent from the representative sample and 60 per cent of these firms participated in the questionnaire (120 firms). Therefore, the analysis of data is based on the 72 firms who successfully responded to the questionnaire.

It was also planned to administer 55 questionnaires to consultancy firms (see 5.5.1 and 5.6.5) including 2 public and 53 engineering offices and consultancy firms. However, only 44 were administered: 2 (4%) state-owned firms, 26 (47%) engineering offices and 27 (49%) consulting engineering offices or firms. 11 firms (20 per cent) could not be contracted owing to personal, technical and administrative reasons. Around 43 per cent (24 cases) of the representative sample of consultancy firms successfully responded to the questionnaire while, of the rest, 7 (13 cases) were wrongly classified as consultancy firms; 11 per cent (6 cases) were discarded, and 13 per cent (7 cases) were unwilling to answer the questionnaire. Therefore, the response rate of consultancy firms was also 80 per cent from the total representative sample of 55 firms.

It was intended to administer thirty two questionnaires to public and private clients of construction projects in Tripoli city. Four (12.5%) of these were private and the rest were public clients (the vast majority of clients of formal construction projects were public bodies). However, only 17 (53.1%) of the 32 clients were contacted during the survey,

while 15 clients (one private and 14 public) could not be contacted owing to administrative, personal and technical circumstances. Furthermore, only 38 per cent (12 cases) of the 32 clients responded successfully to the questionnaire; 6 per cent (2 cases) were discarded and 9 per cent (3 cases) were unwilling to participate. Therefore, the response rate achieved for the clients' questionnaire was 53.1 per cent of the sample. This is, in general, owing to lack of access to clients, and because a majority of clients were government departments or public agencies.

Table 5.8 shows that, out of the total survey sample (237 cases), 108 cases (45.6 %) successfully responded to the three questionnaires, while 6.8 per cent (16 cases) were wrongly classified, 9.3 per cent (22 cases) were discarded, 23.6 per cent (56 cases) could not be contacted, and 14.8 per cent (35 cases) were unwilling to participate in the survey. Also, the data indicates that the majority of the survey sample (76.4 per cent; 181 cases) were contacted during the survey, and the analysis of the empirical data is based on the 108 (45.6%) successful responses. Questionnaire surveys of the CI often achieve low response rates owing, in part, to the nature of the work and the shortage of time in the industry (Kartam et al., 2000a, p.285). However, given Libya's circumstances and the fact that this is the first survey of the LCI, the response rates achieved in this study are acceptable.

Many cases could not be approached and significant numbers of questionnaires were discarded. This can be attributed to the following reasons: The vast majority of streets and roads in Tripoli city lack names and numbers (local authorities should give more attention to this issue). A large number of the respondents lack confidence and experience in dealing with questionnaires. Obeidi (1996) attributed this to the absence of empirical studies in Arabic countries, especially as the political regimes in power tend not to allow people's views and opinions to be stated and tested.

Table 5-8: The overall response rate of the survey sample

The characteristics of responses	Sample survey n=237	Overall response rate %
Responded successfully	108.00	45.57
Wrong classification	16.00	6.75
Discarded cases	22.00	9.28
Could not be contacted	56.00	23.63
Unwilling to participate	35.00	14.77
The representative sample	237.00	100.00

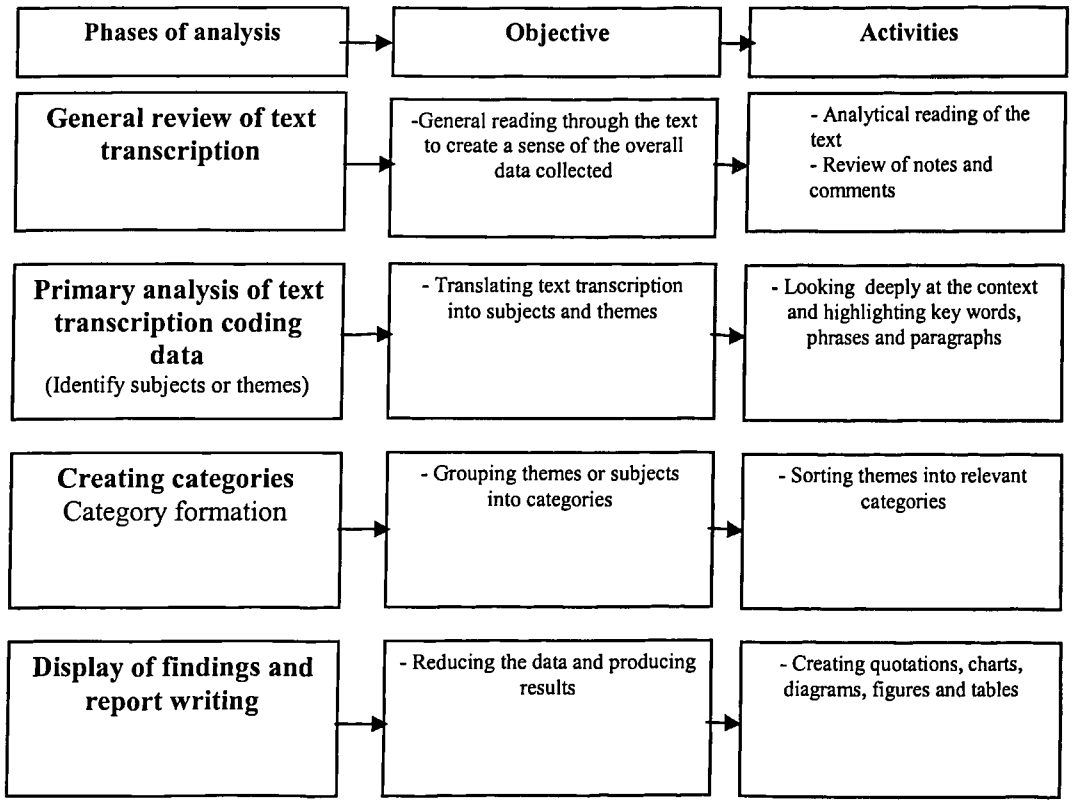
Furthermore, previous surveys in Libya faced the same difficulties experienced during this empirical study. For example, the annual survey of large construction units in Libya conducted by the Ministry of Planning (1983, 1968; p.1-3) was spoilt by lack of clarity and changes in firms' addresses. Tarbagaia (1995) discarded more than fifty per cent of questionnaires in a survey of industrial companies in Libya because of missing data. Based on these circumstances, two points can be made. Firstly, the survey failed to approach all cases of the representative sample owing, in general, to social, administrative and technical reasons (see 5.9 and 9.11); and secondly, in spite of the high response rates achieved by the survey, a significant proportion of the questionnaires were discarded. However, the survey succeeded in demonstrating that the survey research is appropriate research techniques in exploring the key issues, processes and operations of the LCI. Nevertheless, close attention must be given to the social and cultural context.

5.8.3 Analysis of Interview s and Other Supportive Research Activities

The analysis of the interviews' qualitative data was organized around content analysis. Fielding et al (2004, p.530) state that context analysis was one of the earliest approaches to the analysis of texts. Lists of words are important tools in this tradition. One of the most familiar kinds of word list, the index, shows not only which words appear in a text but also their position. Thus, the ideas, opinions, and views of the interviewees are extracted from the text. Each interview was transcribed and analyzed manually. The analysis of the interviews is summarized in table 5.9 and described in more detail in appendix C.

The first step includes preparing a clear text transcription from the replies of the interviewees, According to Dey (1998, p.83), "the aim of reading through our data is to prepare the ground for analysis. We can compare the actions of reading the data with a bit of gardening. By digging over the ground, we loosen the soil and make it possible for the seeds of our analysis". The second phase is the analysis of the text transcriptions by which the key words, phrases and paragraphs relevant to the enquiry are marked and highlighted in different colours. Moreover, paragraphs to be cited from the transcription are underlined and marked in a specific colour. Finally, relevant paragraphs are extracted and organized in tables under different headings. The main objective of this phase is to summarize the transcriptions, to identify the relevant themes, to translate and classify interviewee opinions, views and perceptions into subjects.

Table 5-9: Analysis of qualitative data



Source: Adapted from Creswell (1998) and Marshall, and Possman (1999).

The third phase consists of creating coding categories in to which subjects are grouped. The central objective of this phase is to group subjects under a particular title or a heading. The final step of the process is to display and present the findings of the analysis using many techniques, such as quotation, citation, charts, diagrams, tables and figures (for more detail see appendix C).

The above procedures were employed to handle all of the interview data and information. The findings from the interview survey were categorized under four broad issues or themes. These are: The CI in Libya (definition, scope, development, indigenous resources, informal sector, policies, organization, regulation, obstacles and future vision, etc.); construction resources (construction materials, workforce, land, finance and management); operation processes and procurement methods (subcontractors, role of the informal sector, role of key actors, efficiency of contracts, etc.); and obstacles constraining the industry's operations (delays in payments and to projects, tribalism, unstable economic and instutional environment, irregular supply of basic construction materials, lack of

experienced workers, etc.). These categories are tabulated and discussed in more detail in appendix C.

However, owing to the nature of the study, the type of research questions and the main purpose of the study, as well as time and financial constraints, it was decided to extract bits of data and information (citations) which are relevant to the key findings and issues of the study from the text transcriptions. These were used as a means to present the results of the researcher's observations, interviews, views, opinions and perceptions of interviewees and, finally, they were used to underpin the analysis, argument and discussion.

Furthermore, for the analysis of comments and notes based on observations, the physical survey of the built environment, the characteristics of the operating environment and people's attitudes towards construction, citations were extracted from transcriptions of informal interviews and discussions with traditional builders, workers, informal contractors and many others. Furthermore, dozens of photographs narrated the historical and technological development of the LCI and its associated products and operations in general and in particular in the city of Tripoli (see appendix E). Opinions and views were collected from the review and analysis of two diaries of project site managers and three correspondence files of projects. Furthermore, views and comments were compiled from the comments of workers in five construction firms and two consultancy firms and projects. Consequently, the results of the above analysis were categorized under four main issues or headings: the historical and technological development of the LCI; key features of consultancy and construction firms; barriers and obstacles impeding the operations of the industry; and general opinions and views regarding the LCI and its associated processes and operations. These results were combined with the findings from the different phases of analysis in this study.

5.9 Limitations of the Empirical Study

The empirical research in this study suffers from a number of limitations. Every effort was made to overcome these and limit their influence on the empirical study and its findings. The first limitation was the lack of any prior theoretical and empirical studies in the area. The second was a general shortage of data and information regarding the LCI. The third limitation was related to the social/cultural context of the context of the study. The responses to the research were not very encouraging in terms of the desire to

participate in the survey. This was attributed, in general, to personal and cultural circumstances. The researcher tried to overcome this challenge in the following ways.

A. An attempt was made to utilize the characteristics of Libyan society, such as tribe, family, social and friendship relationships to serve the survey procedures. As a result, social and work relationships were used successfully to gain access to data sources, administer the questionnaire, and conduct interviews. Many firms and respondents were approached with the help of relatives and friends via the telephone or personal contacts.

B. Great patience and understanding was used in dealing with those who were not interested in participating in the questionnaires and interviews. The researcher tried hard to encourage them to change their minds using several techniques, such as a well-planned introduction to the research aims and objectives. It was also critical to understand the general characteristics of the speech of the Libyan people, who generally speak loudly, express many meanings and signs using body language, and use exaggeration and generalisation to avoid making clear and direct decisions. As Loosemore et al (1999, p.97) argued, "Arabs are likely to skirt around a subject before addressing it". The general research limitations are discussed in chapter nine.

Chapter Six

6 General Characteristics of the Key Actors and Firms

6.1 Introduction

The objective of this chapter is to present the study's findings concerning the main general characteristics of actors (consultants, contractors and clients) in the LCI, and the key features and resources of consultancy and construction firms. The chapter is divided into four main sections. Section one identifies the general characteristics of the key actors (consultants, contractors and clients). In section two, the profile of the respondents' work and their experience in construction is discussed. Section three presents the key features of firms, and section four explores their main resources. Finally, a summary is given and conclusions are outlined.

The information in this chapter was compiled from the responses of consultants, contractors and clients to the questionnaires, and the results which emerged from observation and interviews. The analysis and discussion are based on the overall responses of the survey sample of consultants, contractors and clients to the questionnaires, and from interviews and visits to firms and projects. To confirm the statistical significance of the findings, the results are subject to the ANOVA test where possible.

6.2 Characteristics of the Key Actors

To identify the personal characteristics of the key actors in the LCI, respondents were asked four questions related to their gender, age, education and qualifications in construction (see appendix A). The results are firstly described and discussed and an analysis of variance (ANOVA) at the 5% significance level conducted in order to test whether or not the characteristics of key actors varied significantly.

6.2.1 Gender and Age of Respondents

As anticipated, the majority of respondents participating in the survey were men. Only three women participated in the questionnaire survey, and no women were interviewed. This indicates that the LCI is dominated by men. The NCID (1999, p.140) indicated that the participation of women in the construction sector was 0.6 per cent in 1980, 0.5 per cent in 1984 and 0.4 per cent in 1999. Previous studies such as Al-Hawaat (2004, p. 9) indicated

that women show low levels of representation in the formal Libyan economy (see 3.6.3). However, in an informal interview during the empirical research in this study, an older builder pointed out that, in Libyan traditional society in the Tripoli region, much construction work was conducted by women, such as gathering raw materials and coating internal walls. In addition, it may be observed that there are some women working in official and professional jobs in construction and consultancy firms.

Therefore, it can be said that women are barely present in the LCI, as in most Islamic and Arabic countries owing, in general, to the nature of construction work and social and cultural circumstances. The phenomenon of the low representation of women in the CI also exists in many other countries, such as Turkey (Arslan et al., 2004, p. 1379), and Sri Lanka (Jayawardane et al, 1998, p.524). However, in some developing countries, women do participate significantly in construction activities. For instance, in India women represent more than 30 per cent of the construction workforce (ILO, 2001, p.13).

Table 6.1 illustrates the age distribution of the respondents. As can be seen, 54.6 per cent (59 respondents) of the sample (108) were aged between 35 and 49 years old. The youngest respondent in the sample was a consultant at 25 years old, while the oldest was a contractor at 67 years. The mean ages of contactors, consultants and clients were 45.6, 45.3 and 43.8 years respectively, and the overall mean average of the survey sample was 44.9 years. These results are supported by the discussion in chapter three which concluded that the structure of the Libyan society is dominated by persons aged between 25 and 49. Therefore, a majority of key actors in the LCI were physically fit enough to work in construction business.

Table 6-1: Age distribution of the survey sample

Age range (years)	Contractors n=72 (%)	Consultants n=24 (%)	Clients n=12 (%))	Overall n–108 (%))
25-34	12.5	16.7	8.3	13.0
35-49	55.6	54.2	50.0	54.6
50-64	30.6	29.2	41.7	31.5
over 65	1.4	0.0	0.0	0.9
Mean age	45.6	45.3	43.8	44.9

An analysis of variance (ANOVA) was undertaken at the 5 per cent significance level. The results showed that the F ratio is 0.392 and the observed significance level is

0.677 (value of F with probability less than 0.05 indicates that there are significant statistical differences between groups. When its significance is more than 0.05 this suggests no statistically significant difference). This suggests that there is no significant difference in ages among groups of respondents. Thus, it seems reasonable to conclude that, the LCI is relatively dominated by men aged between 25 and 49.

6.2.2 Educational Background

The empirical findings in table 6.2 provide information about the educational level attained by respondents. Nearly 38 per cent (41 respondents) of the overall respondents had Bachelors degrees. The results imply that a remarkable number of the respondents are well educated (with Diplomas, Bachelors, Masters and PhD degrees). Also, the results show that 2.8 per cent (3 respondents) of the overall survey respondents had Masters degrees and 3.7 per cent (4 respondents) had PhDs. However, it was observed that some of the respondents' educational backgrounds were not relevant to the construction business. Some used to work as teachers, accountants, or agricultural engineers. This may give an indication that the construction business in Libya, as elsewhere, is easy to enter, as the literature suggests (see chapter two).

Table 6-2: Educational level of the survey sample

Educational level	Contractors n=72 (%)	Consultants n=24 (%)	Clients n=12 (%))	Overall n=108 (%))
Under primary	2.8	0.00	0.00	1.85
Under secondary	15.3	0.00	8.3	11.1
Secondary	33.3	0.0	8.3	23.1
Diploma	20.8	12.5	25.0	19.4
Bachelors	23.6	75.0	50.0	37.9
Masters	2.8	4.2	0.00	2.8
PhD	1.4	8.3	8.3	3.7
Illiteracy	0.00	0.00	0.00	0.00
Total (%)	100.00	100.00	100.00	100.00

From this, two points can be made. Firstly, none of the respondents were illiterate. Of course, the respondents occupied high positions in their firms. In addition, this result is supported by a survey of the workforce in Libya which indicated that only eleven per cent of the total workforce in Libya was illiterate (see chapter three). Secondly, the number of respondents holding Masters and PhD degrees seems high. This is mainly because the state has encouraged postgraduate education and the CI is concentrated in the Tripoli region, as addressed in chapters three and four. Also, over the past three decades, a most significant

achievement in Libya has been the development of human resources in terms of increases in the numbers of educated people (GCP, 2000, p.71) Added to this, the UNDP reported that the education enrolment rate was 89 per cent in 2003 (www.undp-Libya.org, 2005).

An ANOVA analysis showed an F ratio of 14.8 and an observed significance level of 0.000. This indicates that there are significant statistical differences in educational background among the respondents. Consultants and clients are more educated than contractors (see table 6.2). This suggests that the qualifications and training of contractors should be given close attention. The majority of respondents were relatively well educated. In particular, consultants and clients had relatively high educational levels.

In short, two points can be made. Firstly, the LCI's strengths lie in the personal characteristics of its key actors, and secondly, it is argued here that opportunities to develop the operations of the LCI do exist.

6.2.3 Construction Qualifications

The survey sample was asked to indicate how they acquired qualifications in construction. The results in table 6.3 show that nearly 42 per cent (45 respondents) of respondents had acquired qualifications by experience, about 38 per cent (41 respondents) by formal or professional education, 7.4 per cent (8 respondents) by formal vocational training, and the rest (12.9 per cent, 14 respondents) indicated that their qualifications were irrelevant to the construction field. More than 58 per cent (42 respondents) of the respondents from construction firms gained qualifications in construction by experience.

Table 6-3: Acquisitions of construction qualification and skills

Qualification	Contractors n=72 (%)	Consultants n=24 (%)	Clients n=12 (%))	Overall n=108 (%))
Professional	19.4	95.8	33.3	37.9
Experience	58.3	0.0	25.0	41.7
Technical qualification	9.7	4.2	0.0	7.4
Irrelevant qualification	12.5	0.0	41.67	12.9
Total (%)	100.0	100.0	100.0	100.0

This is consistent with the finding in section 6.2.3, which indicated that more than fifty-one per cent of contractors had educational levels ranging from under primary to secondary certificates. Therefore, it could be said that most contractors acquired qualifications in construction by experience and through informal channels, as in most developing countries (see 2.3.5).

Nearly ninety six per cent (23 respondents) of respondents from consultancy firms had professional qualifications in construction or related subjects (see table 6.3). This is because the nature of business in the consulting sector is based on design projects.

In order to identify the nature and background of the qualifications of consultants, they were asked to mention their occupations. The results showed that among the 24 respondents from consultancy firms, 10 (41.7%) were architects, 12 (50%) were civil and structural engineers, and 2 (8.3%) were mechanical and electrical engineers. These results give an indication that the consulting sector is dominated by architects and civil engineers. This could indicate that the LCI lacks engineering services such as quantity surveyors, and mechanical and electrical services. This is supported by the records of the General Association for Engineers in 2004, which showed that the vast majority of consultancy and engineering offices and firms were registered as architectural and civil engineering consultants. It is suggested this that gap should be bridged by promoting qualifications and training in areas relevant to engineering services.

Also, the results in table 6.3 show that the proportion of respondents from construction and consultancy firms who acquired qualifications in construction through formal vocational training schemes and formal apprenticeships was relatively low. This may indicate that, despite the state's efforts in training, the number of Libyans involved in construction training courses remains relatively low (see 4.7) and construction is not an attractive field for Libyans. This is supported by the views of an experienced decision maker who was interviewed. He said that that the state had opened a large number of formal training centres in construction over the past two decades, but some had closed because Libyan youths were not interested in training in construction, particularly in operational work. Even the few Libyans who had trained did not work on construction sites. The majority showed a great willingness to undertake formal training courses in construction only because they wanted to obtain the government's craft training certificate in construction, which would enable them to be employed in the public construction sector (see 4.7). This confirms that the issue of training in construction should be assessed and rethought in order to make construction a more desirable occupation.

Furthermore, the above results show that a significant proportion of the respondents' qualifications, particularly for clients and contractors, were irrelevant to construction. This is supported by the findings in section 6.2.2, which indicated that a significant number of the

respondents had qualifications in other fields. It may be asked why clients should need to be qualified in construction; the survey showed that the vast majority of clients of major construction projects were public clients. Thus, a qualification in construction is necessary for their representatives in order to be able to make the right construction decisions.

To identify differences among respondents' qualifications, an analysis of variance (ANOVA) was undertaken at the 5 per cent significance level. The results show that there were significant statistical differences in the qualifications of the respondents (the F ratio is 30.5 and the observed significance level is 0.000). This suggests that the qualifications of key actors in the LCI vary significantly owing to differences in their responsibilities and roles in the CI. In short, it can be said that the LCI is generally led by educated managers or actors. However, a significant proportion of staff qualifications are irrelevant to construction

6.3 Profile of Respondent's Work and Experience in Construction

To explore the respondents' previous work and experience in the CI, they were asked a set of questions, including position in their current firms, number of years working in the construction sector and in the current firm, and previous work. The responses to these questions are presented in this section under the following four main headings: position in the firm, experience in construction, place of previous work, and reasons for working in construction.

6.3.1 Position in the Firm

More than eighty-three per cent (90 cases) of respondents' were general managers, managers and directors in their firms, while the rest were members of administrative committees, owner-builders and partners in firms (see table 6.4) This implies that the survey succeeded in approaching senior figures in the LCI, as was planned (see 5.4. and 5.5). Added to this, the respondents might have had considerable practical experience and broad knowledge regarding practices in their firms, the operations of the LCI, and the major obstacles constraining the industry. It is believed that this increases the validity of the data and the findings of the survey. However, many of the respondents were directors and members (partners) of the administrative committees.

Two main reasons were responsible for the success in approaching so many senior managers. Firstly, the researcher and his two assistants had good previous knowledge and

relationships with most of the managers, and secondly, the empirical research was carried out carefully in phases (see chapter five).

Table 6-4: Official position of the respondents

Educational level	Contractors n=72 (%)	Consultants n=24 (%)	Clients n=12 (%))	Overall n=108 (%))
General manager	27.9	20.8	16.7	25.00
Manager	36.1	45.8	33.3	37.9
Director	25.0	8.3	16.7	20.4
Member of administrative committee	11.1	16.7	8.3	12.0
Partner in the firm	0.0	8.3	0.0	1.9
Owner-builders	0.0	0.	25.0	2.8
Total (%)	100.0	100.0	100.0	100.0

6.3.2 Experience in the Construction Sector

The respondents were asked to indicate the length of time that they had been working in construction or its related activities and in their current firms or organizations. Then, they were also asked to mention their previous places of work. The purposes of these questions were to identify the respondents' experience and the stability in their work background.

Table 6-5: Experience working in the CI

Experience (years)	Contractors n=72 (%)	Consultants n=24 (%)	Clients n=12 (%))	Overall n=108 (%))
0-3	1.4	4.2	16.7	3.7
4-7	8.3	4.2	8.3	7.4
8-11	29.2	20.8	8.3	25.0
12-15	18.06	25.00	33.33	21.3
16-19	16.67	16.67	16.67	16.6
Over 19	26.39	29.17	0.00	24.0
No answer	0.00	0.00	16.67	1.9
Total (%)	100.0	100.0		100.0

As can be seen from table 6.5, only 3.7 per cent (4 respondents) of the sample had been working in construction and its related activities for between one and three years. It was rather surprising that more than 88 per cent (96 respondents) of the respondents had been working in the CI for more than eight years. The mean lengths of working in the CI were 14.4, 14.5 and 12.2 years for contractors, consultants and clients respectively. These results indicate that most respondents were experienced in construction activities and operations. Informal discussions conducted with some of the respondents showed that the majority of them used to work in public and state-owned companies in the 1980s and 1990s

(see chapters three and four). It could be argued that, the public sector has played an important role in training the current managers and operators in the LCI.

Furthermore, the results in table 6.6 indicate that more than 90.7 per cent (98 respondents) had been working in their current firms or organizations for between one and fifteen years. This result shows that most respondents had relatively stable positions in their firms; they should have considerable practical experience.

Table 6-6: Experience in working in current firms

Experience (years)	Contractors n=72 (%)	Consultants n=24 (%)	Clients n=12 (%))	Overall n=108 (%))
0-3	11.1	4.2	0.00	8.3
4-7	25.0	8.3	33.33	22.2
8-11	44.4	25.0	0.0	35.1
12-15	16.7	41.2	41.7	25.0
16-19	0.0	16.7	0.0	3.7
Over 19	2.8	4.2	0.0	2.8
Total (%)	100.0	100.0	100.0	100.0

It was surprising to find that, despite the intensive changes in the organization and structure of the LCI over the past two decades (see chapters three and four), its staff were loyal to the sector. This finding disagrees with the view of the GCP (2003, p. 32) which concluded that, owing to instability (frequent changes in institutions, administration and laws and regulations) in the LCI and its operating environment, the industry has lost a significant number of their most qualified and experienced staff and managers.

The ANOVA test at the 5% significance level did not show any statistically significant variation in the respondents' experience in construction (the F ratio is 0.129 and the observed significance level is 0.879). However, there is a significant statistical difference between consultants, contractors and clients in terms of stability in their firms (the F ratio is 14.33 and the observed significance level is 0.000).

In the light of the above, it seems reasonable to conclude that despite the intensive changes in the LCI in terms of institutions and organization, the industry's workforce is characterized by stability. In order to further clarify this issue, the respondents were asked to indicate the place where they had worked prior to joining their current firms.

6.3.3 Previous Place of Work

To explore the work background of the respondents, the survey sample was asked to mention their place of work before joining the current firms or organizations. The findings are presented in table 6.7. More that thirty-seven per cent (40 respondents) of respondents (108) used to work in government departments. It is no surprise that only a few respondents had worked in the private sector before being members of their current firms. This is mainly because of the dominance of the public sector in Libya in the 1980s and 1990s (see chapters three and four). This is supported by the findings in sections 7.2.3 and 7.3.5, and by the results of government reports which indicate that one of the key features of the employment market in Libya was the dominance of the public sector (see chapter three).

Table 6-7: Place of work of the respondents before joining the current firm

Experience (years)	Contractors n=72 (%)	Consultants n=24 (%)	Clients n=12 (%))	Overall n=108 (%))
Government	25.0	62.5	58.30	37.1
Construction firm	33.3	25.00	16.7	29.6
Self-employed	30.6	4.1	16.7	23.15
Consultants firm	2.8	8.3	8.3	4.63
Others	8.3	0.0	0.0	5.56
Total (%)	100.0	100.0	100.0	100.0

It seems that when the state decided to reorganize the CI according to socialist laws, most of the respondents established or joined partnerships and cooperative firms (see chapters three and four). In addition, it was observed that work and management culture and attitudes are based on the concepts, philosophies and scope of public administration. This may raise the issue of training key actors in the principles of an open economy in which the private sector, competition and innovation are the key drivers of business success.

Furthermore, the following points about the respondents were observed. Firstly, the majority of consultants were working part time. Secondly, a significant number of the respondents in construction and consultancy firms were retired; and thirdly, the majority of clients were employees of government or public agencies. This is mainly because most formal construction projects were owned and funded by the government at the time of this study (see chapter seven). The ANOVA test shows that are statistical differences at the 5% significance level among the respondents' work background (the F ratio is 3.27 and the observed significance level is 0.04).

6.3.4 Reasons for Working in the Construction Industry

To address the key motivational factors, the respondents were asked why they worked in the CI. Table 6.8 shows that there were three dominant reasons, including the high potential profit in construction business, and experience and qualifications in construction. It was surprising that 33.3 per cent of the sample (36 respondents) indicated that they worked in the construction business because of its high profit levels. In addition, more than 24 per cent (26 respondents) were involved in construction because of their qualifications, and more than 23 per cent (25 respondents) pointed out that they worked in construction because of their previous experience in construction. However, clients regarded experience and qualification as the most important reasons.

Table 6-8: Reasons for working in the construction industry

Experience (years)	Contractors n=72 (%)	Consultants n=24 (%)	Clients n=12 (%))	Overall n=108 (%))
Qualification	5.6	79.2	25.0	24.1
Experience	26.4	8.3	33.33	23.2
Lack of work	6.9	4.2	0.00	5.6
High profit	47.2	8.3	0.00	33.3
Family's business	8.3	0.00	0.00	5.56
Others	5.6	0.00	41.67	8.33
Total (%)	100.0	100.0	100.0	100.0

From the table, it is clear that a small number of families are associated with the construction business. This is possibly because of the intensive changes in the social and economic environment as well as in the organization and structure of the LCI over the past three decades, as has been discussed in chapters three and four. From the point of view of a key decision maker in the General Council for Planning, there are four main reasons underlying working in construction. Firstly, construction is seen by most Libyans as a business by which one can generate money in a short time. Secondly, the laws and regulations concerning starting up a construction firm do not prioritise qualifications or background. Thirdly, it is easy to establish and run businesses in construction (and any other sectors), owing to administrative corruption and social nepotism; and fourthly, the state has encouraged Libyans to establish firms in construction in order to distribute wealth and increase the income of partners (see chapters three and four).

To identify any significant statistical differences in the opinions of consultants, contractors and clients on the reasons behind working in construction, the ANOVA test at

the 5% significance level was undertaken. The test showed that there are significant statistical differences (the F ratio is 22.61 and the observed significance level is 0.00) among respondents. This may suggest that the performance and strategies of contractors, consultants and clients might be different.

To sum up this section, the key actors of the CI in Libya have considerable practical experience in construction and its related activities. This gives hope for developing the LCI and its associated processes and operations. Added to this, the occupational stability of managers in the LCI is relatively high. In addition, the public sector has played an important role in training the current managers and operators in the LCI. Finally, the CI is seen as a profitable business in Libya by contractors and consultants. It is clear that these factors have formed the current culture, operations and shape of the LCI. The influence of these characteristics on its operations are analyzed and discussed in the following chapters.

6.4 Key Features of Firms

The respondents were asked to answer a set of questions about the key features of their firms, including the date of its establishment, the legal status of the firm, the ownership structure, the scope of activities, the firm's workload, permanent staff, annual turnover and management and training courses.

6.4.1 The Establishment of Firms

When respondents from construction and consultancy were asked whether they had established their firms or not, more than eighty per cent (77 of respondents) indicated that they had established their firms with partners, while the remaining 17.7 per cent (17 respondents) had not. 2 firms did not provide answers. Generally, this agrees with the discussions in chapters three and four, supported by the annual report of the Commercial Registration Office (GPCTE 2004) which indicated that all firms and organizations working in the CI were based on partnership laws and regulations. On the other hand, the results may reflect the strong influence of political ideology on the organization of the LCI. Furthermore, the results confirm that individually-owned firms were prohibited, and access to the construction business was regulated according to socialist laws (see chapters three and four). The ANOVA test showed that there are no significant statistical differences

between consultants and contractors on the method of starting up their firms (the F ratio is 0.49 and the observed significance level is 0.48).

However, one of the key observations in the current research noted throughout the course of the empirical study was that most construction and consultancy firms were established according to tribal principles. In this sense, domestic partnership firms tended to have tribal roots and foundation; partners were usually from one family, clan, or tribe or from allied tribes. Furthermore, a majority of managers in each firm are relatives from one tribe or family. Therefore, it may be said that, at the time of study, partnership principles and tribalism are two of the main key factors affecting the establishment, organization and shape of firms in the LCI. This pattern of management is likely to influence the operations of firms, for example in terms of an inability to make decisions without considering social relationships and pressures. Furthermore, employment in the CI, and particularly in the public sector, is generally influenced by kin relationships and tribal and social nepotism. This may lead to that the conclusion the extended family and tribe are two main traditional social and economic units in Libya (see 3.5.2 and 6.4.1). These units can be considered as the basis of the traditional partnership firm in Libyan society. Generally, it was observed that, the attitudes and decisions of individuals are often affected by their loyalty to their tribes and families (see chapter three).

Furthermore, from previous experience in working in the construction sector in Libya, tribal and social relationships do play an important role in obtaining work and gaining access to information and other services relevant to construction such as finance, supplies of cement and steel, and many other relevant services (see 7.3.2). In addition, the tribal lands system has an indirect influence on the operation of the CI (see chapters three). According to this system, each tribe owns particular lands. For instance, from government reports there are a number of recorded cases in which tribes have refused to use their own lands as sites for public construction projects. Thus, the management and operations of the LCI are influenced by social structure and tribalism. This must be taken into account when investigating the CI in Libya and when selecting construction sites. Thus, tribalism is one of the key factors which has affected (and are still affecting) the operations of the LCI in terms of management and access to construction work and services. Generally, firms in the LCI are established according to tribal principles.

Consequently, some argue that tribalism and its associated features and attitudes have constrained economic growth and development efforts in Libya (World Bank 1960, p.9). Furthermore, there is a view which argues that "a more significant political risk than even the price of oil is posed by Libya's tribal structure" (www.newnations.com, 2005). However, social and tribal relationships might also be utilized as a means to prompt partnering in construction business and operations. Therefore, informal relationships and communication channels are key features of the LCI's operating environment (see chapter seven).

It seems reasonable to conclude that, despite the strong commitment of the state to regulate construction activities and establish a formal construction industry, the informal sector is inevitably of significance in Libya's social and tribal context. However, tribalism and its associated attitudes should be utilized to improve the operation of the industry. Recommendations concerning this issue are given in chapter nine.

6.4.2 Date of Starting up of Firms

The respondents were asked to indicate the date of establishment of their construction and consultancy firms. Table 6.9 provides a breakdown of the age of the firms. More than thirteen per cent of the firms (13 firms) started operating in construction between 1970 and 1987, while the majority (86.5%) were founded between 1988 and 2004. This should come as no surprise, because the state has allowed cooperative family and domestic partnership firms to be formed by Libyans since the second half of the 1980s (see chapters three and four).

Table 6-9: Date of start-up of the respondents consultancy and construction firms

Date of start-up	Contractors n=72 (%)	Consultants n=24 (%)	Overall (%) n=96 (%)
1970-1975	1.4	0.0	1.0
1976-1981	1.4	0.0	1.0
1982-1987	12.5	8.3	11.5
1988-1993	23.6	41.7	28.1
1994-1999	40.3	45.8	41.7
2000-2004	20.8	4.2	16.7
	100.0	100.0	100.0

This may imply that firms have a relatively short age and practical experience in the construction sector and its related operations. The results are supported by the findings of Al-Gallie et al. (1998); and Abn-Altieef et al. (1998), which indicated that most Libyan consultancy and engineering firms in Libya started operating since the end of the 1980s (see 4.6.3).

The age of the majority of consultancy and construction firms is relatively young in terms of their dates of establishment, and it was somewhat surprising that few firms were founded in the 1970s and the first half of the 1980s (see table 6.9). This is possibly because numerous public construction firms at that time were privatized or merged with other firms, or in some cases abolished. Additionally, foreign construction enterprises were dominant during that period, but they then withdrew from the country owing to sanctions and the failure of oil prices in the 1980s and 1990s (see chapters three and four). These factors can be considered as key factors forming the current shape and operations of the LCI.

6.4.3 Legal Status and Type of Firms

As was anticipated, the vast majority of firms in the LCI complied with the state's laws and regulations at the time of this study. When the respondents from construction and consultancy firms were asked a set of questions regarding the firm's status, including registration, legal status and ownership structure, the survey showed that about 97 per cent (93 firms) were registered according to regulations (see chapter four), while nearly three per cent (3 firms) failed to answer this question. Hence, it may be said that firms were highly likely to comply with registration laws and regulations. This is mainly because the survey targeted formal firms.

The compliance of the respondents from consultants and contractors firms with legal registration can be attributed to the nature of sample and the fact that firms, particularly construction firms, enjoy advantages from being formally registered. These include having access to formal contracting work which is considered a means of achieving a continuity of work and a high level of profitability. Secondly, registration enables firms to have opportunities for obtaining buildings materials such as cement and steel from state-owned plants according to state subsidies and prices. Access to financial services, hard currency, licenses for importing construction materials, labour and equipment is also facilitated.

When the respondents from construction and consultancy firms were asked to indicate their firms' legal status, the findings confirmed that domestic partnership firms (Sharika Musahima) made up 68.8 per cent (66 firms), co-operative family firms (Tasharrukyya) accounted for 18.8 per cent (18 firms), state-owned and public companies represented 8.3 per cent (8 firms), and the remaining 4.2 per cent (4 firms) were joint ventures and foreign companies (see table 6-10). Unsurprisingly, as mentioned previously,

no one-man businesses operated. This is in contrast with circumstances in most developing countries where firms are sole ownerships and led by entrepreneurs without expertise in construction who run business in other fields (Ofori, 1980).

Table 6-10: The legal status of the respondents' construction and consultancy firms

Experience (years)	Contractors n=72 (%)	Consultants n=24 (%)	Overall (%) n=96 (%)
State-owned firm	4.2	8.3	5.2
Public firm	4.2	0.0	3.1
Joint venture firm	2.8	0.0	2.1
Partnership firm	65.3	79.2	68.8
Cooperative family firms	20.8	12.5	18.8
Foreign firm	2.8	0.0	2.1
One-man firm	0.0	0.0	0.0
	100.0	100.0	100.0

The ANOVA test was undertaken at the 5% significance level, and showed no significant statistical differences between construction and consultancy firms regarding their commitment to registration (the F ratio is 1.02 and the observed significance level is 0.315). Also, the test did not show any significant statistical differences between consultancy and construction firms concerning ownership (the F ratio is 3.63 and the observed significance level is 0.60). Therefore, it can be said that consultancy and construction firms strongly complied with registrations laws.

Through the semi-structured interviews with decision makers and the analysis of documents (see appendix A and C), the key features of the partnership system in Libya and its influence on the operations of the LCI were investigated. Partnership in the LCI is based on rather narrow definitions, where its main goal is to organize economic activities of the domestic and private sector according to the rules of the socialism or what is known in Libya as 'populist ownership' in which people run, fund and own a firm as partners. In this sense, individuals can share capital and effort in order to run a firm or a business (see 3.4.3 and 4.4.1). The number of partners and amount of financial capital are the most important factors in determining the type and category of a firm, and the main goal is to distribute wealth among partners (Government of Libya, 2001; see appendix D for legislation affecting the organization and operations of the CI in Libya).

The literature on the CI shows that in recent years partnering has been used in the CI as a procurement system to encourage co-operation between particpants (see 2.3.3). Thus, it is

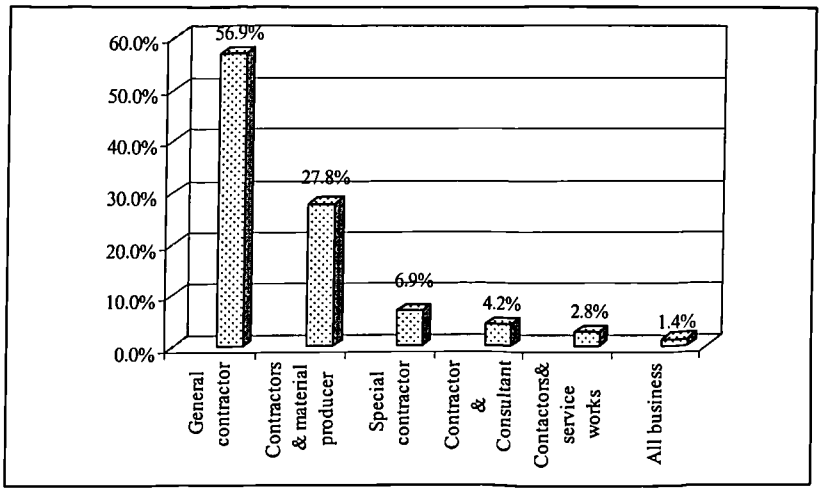
argued that the existing partnership system in Libya should be redefined and developed. As Hamza (2002) suggested, "partnering refers to a long-term agreement between companies to an unusually high degree of commitment to achieve separate yet complementary objectives".

From the above, it is found that there has been a remarkable change in the ownership structure in the LCI from public to domestic partnership over the past decade. At the time of the study, there were five types of ownership structure of consultancy and construction firms in the LCI, including: partnership firms (Sharika Musahima) cooperative family firms (Tasharrukyya); state-owned and public companies and organizations; foreign firms; and joint venture firms, the majority of which were general contractors (see 6.4.3, 6.4.4 and 6.5.2). The above sudden and subsequent changes in the legal environment have affected the overall shape and current operations of the LCI in terms of workload, type and size of firms and industrial relationships. Key conclusions and recommendations concerning this issue are given in chapter nine.

6.4.4 Scope of Activities

To identify the scope of activities of construction and consultancy firms, respondents were asked to mention their firms' main activity. The findings showed that 37.5 per cent of consultancy firms (9 firms) were architect/engineering offices, while the remaining 62.5 per cent (15 firms) were consulting offices or firms (see 4.6.3 and figure 4.10).

Figure 6-1: Type of construction firms



Also, of the 24 consultancy firms surveyed, 14 (58.3%) were involved in all consulting work including architectural and structural design, supervision, construction and

project management and other consulting activities, 6 (25%) conducted only architectural design works, and the remaining 4 (16.7 %) conducted structural design work only. The results imply that there is a lack of specialist consultancy firms, coinciding with the findings in section 7.2.2 and 7.2.3 which indicated that firms and engineering offices conducting architectural and civil work are dominant. Furthermore, the results in figure 6.1 show that most construction firms (60%) were general contractors. However, nearly, 28 per cent (20 firms) were contractors and producers of construction materials and other components.

This agrees with the records of the Commercial Registration Office (GPCTE, 2004), which indicated that general contractors dominate the industry; most firms were observed to be working in all types of construction projects (see 2.5 and 2.6). This may give the impression that a traditional procurement system is likely to be the dominant approach in organizing construction projects, and that subcontractor firms play an important role in the operation of the LCI (see 2.8.2, and 2.6.5). Added to this, the diversification of activities was one of the features of the construction firms surveyed, with a significant number of firms attempting to conduct other activities. According to comments by one of the respondents, an experienced manager in a construction firm with more than twenty years experience, diversification is one of the main characteristics of construction firms in Libya because it protects them from the impact of recessions and the risks of inflation and as unstable operating environment such as occurred in the 1990s (see. 3.6.3, 6.4.5, 8.1 and 8.3). According to Hillebrandt al. (1999, p 41), diversification may contribute to increased profitability for a firm, a search for new business, and efforts to increase the financial stability, operational efficiency and security of the firm.

When the geographical scope of activities is considered, it was observed during visits to construction and consultancy firms (see chapter five) that a majority was operating within the Tripoli region. This is possibly because of a lack of managerial, financial and technical capability, and geographical circumstances and associated costs (see 3.2.2) However, a small number of firms undertook projects in the whole country.

In short, as in most developing countries, the LCI comprises a vast majority of general contractors and a few specialist firms. In such a situation, traditional procurement and subcontracting systems as well as the diversification of activities are usually common practices. These findings are discussed in chapter nine. It is clear that, geographical factors

have affected (and are affecting) the current structure and firms in the LCI in terms of type and scope of activities.

6.4.5 Size of Firms

As explained in chapter four, in this study firms are classified as small, medium or large (see 4.4.2). Based on these considerations, the respondents from construction and consultancy firms were asked a set of questions related to their annual turnover over the three years 2001-03, with the main aim to identify the size of firms in the LCI. This section presents and discusses the findings.

1. Turnover

The empirical findings in this study showed that the annual turnover of consultancy firms ranged from LD zero to over 500,000 (at the time of the study US $1= LD 1.42). As can be seen in table 6.11, the annual turnovers of more than forty eight per cent of consultancy firms were below LD 50,000 in 2001, 2002 and 2003. This indicates that most consultancy firms were small in terms of turnover (the term small in this study is defined in section 4.4.2). The annual turnover of consultancy firms was on average LD 138, 133 and 135 thousands in 2001, 2002 and 2003 respectively. This is mainly because of the nature of business in the consulting sector, and because most consultants in Libya were part-time workers. However, it should be considered that the annual turnover of contractors and consultants is different in terms of value owing to the value and nature of contractors.

Table 6-11: Annual turnover of the respondents' consultancy firms in 2001, 02 and 03

Value of turnover (,000 LD)	Value of turnover (,000 US $)	2001 n= 24(%)	2002 n= 24(%)	2003 n= 24(%)	Overall n= 72(%)
0.00	Less than 0.70	4.2	0.0	0.0	1.4
1-50	0.70-35	45.8	37.5	62.5	48.6
51-100	36-70	25.0	25.0	16.7	22.2
101-150	71-105	4.2	12.5	0.0	5.6
151-200	106-141	0.0	0.0	4.2	1.4
201-300	142-211	0.0	4.8	0.0	1.4
301-400	212-282	4.2	0.0	4.2	2.8
401-500	283-352	0.0	0.0	0.0	0.0
over-500	Over-352	1.2	3.2	4.2	4.2
No answer	No answer	12.50	16.67	8.33	12.50
Total		100.0	100.0	100.0	100.0

Table 6.12 shows a breakdown of the annual turnover of construction firms. As can be seen, more than forty six per cent (100 firms) had annual turnovers between LD zero and 100,000 in 2001, 2002 and 2003. Nearly seventy-nine per cent were between zero and 500,000, only 7.9 per cent of firms had turnovers above 500,000, about four per cent of the

turnovers of firms were LD zero in 2001, 2002 and 2003 (see table 6.12). The annual turnover of construction firms was on average LD 231,219 and 209,000 in 2001, 2002 and 2003 respectively. These figures indicate that the majority of construction firms are also small in terms of their annual turnover.

Table 6-12: Annual turnover of the respondents' construction firms in 2001, 02 and 03

Value of turnover (,000 LD)	Value of turnover (,000 US $)	2001 n= 72(%)	2002 n= 72(%)	2003 n= 72(%)	Overall n= 216(%)
0.00	Less than 0.70	4.2	2.7	5.6	4.2
1-50	0.70-35	12.5	13.9	18.1	14.8
51-100	36-70	29.2	27.8	25.0	27.3
101-150	71-105	15.3	13.9	13.9	14.4
151-200	106-141	5.6	4.2	6.9	5.6
201-300	142-211	9.7	9.7	6.9	8.8
301-400	212-282	1.4	1.4	2.8	1.9
401-500	283-352	0.0	2.8	2.8	1.9
over-500	Over-352	9.7	6.9	6.9	7.9
No answer	No answers	12.5	16.7	11.1	13.4
	100.0		100.0	100.0	100.0

As anticipated in chapter five, it was observed that most respondents were very sensitive regarding questions on firms' turnover and workload. Furthermore, a general manager in the Companies Department in Tripoli's Taxes Authority indicated that a majority of construction and consultancy firms did not provide accurate tax declarations regarding their annual turnovers. Generally, this is a common attitude among firms elsewhere.

To identify why large firms are so rare in the LCI, the decision makers were asked this in the semi-structured interviews. A decision maker in the Ministry of Planning reasoned that productivity in firms is low, their management inefficient, and that they lack financial security. A key manager in the General Council for Planning said that the main aim of the philosophy of partnering in construction in Libya is to establish large firms, but in practice most partners prefer to run small firms owing to operational, economic and cultural reasons. He added that only state-owned, public and foreign companies can be considered as large firms in the country.

Surprisingly, a number of managers of construction and consultancy firms confirmed some of the above arguments when they said that the objectives of their firms were not to generate high turnover and to seek growth but only to enhance their partners' income. This may indicate that firms are led with short-term strategy in which the growth

of a firm is not important. In this sense, the majority of firms in the LCI operated as 'lifestyle' firms rather than for growth (see 2.6.3). One partner and owner-manager (general manager) of a domestic construction firm backed up this conclusion when he stated: "I used to work in a public construction company, but ten years ago the company was abolished. Therefore, I started up this firm with some of my relatives seven years ago. Presently, I see this firm as a source of income allowing me to avoid any economic risk in my life". It may be concluded that most firms' operating strategies are to generate income rather than to achieve any remarkable growth in size and activities, owing to social, economic and administrative circumstances.

To sum up this section, it can be said that, at the time of this study, the current operations of the LCI are affected by the structure of the industry. Small firms lack the financial capability to undertake large projects and to operate efficiently. However, this structure can also be regarded as one of the strengths in the current shape of the LCI. Conclusions and recommendations regarding this issue are presented in chapter nine.

2. Firm Workloads

To explore the workloads of firms in the LCI, respondents from construction and consultancy firms were asked two questions about the number of contracts they signed in 2003, and the number construction of projects underway at the time of the survey.

Table 6.13 shows the number of contracts signed by the consultancy and construction firms in 2003 and the number of projects under way. 28 (38.9%) of construction firms had not signed any contracts in 2003. However, 37 (51.4%) had signed between one and four contracts, and only 6 (8.3%) had signed more than ten contracts. These were mainly state-owned and public firms.

Thus, it is clear that a significant number of the firms had not signed any contracts in that year. This may mean that competition was intensive in Tripoli's construction market, but also it may indicate that the local market was overloaded with construction firms (see 4.6.2). On the other hand, it was also notable that a considerable number of firms had signed between one and four contracts in that period. However, a review of the follow-up report of the GCP (2000b, p. 11) shows that there were 9095 formal construction projects owned and funded by local governments or Shabiat. In 2365 of these (26%) work

had delayed or stopped and 1901 (21%) had not commenced yet. Therefore, the findings concerning firm workloads should be treated with some caution.

Table 6-13: Number of contracts in 2003 and construction projects in operation.

	Consultancy firms		Construction firms	
Number	Number of contracts/ n= 24 (%)	Number of projects n= 24 (%)	Number of contracts n= 72 (%)	Number of projects n= 72 (%)
0.00	25.0	4.2	38.9	6.9
1 to 2	37.5	37.5	34.7	45.8
3 to 4	29.2	45.83	16.7	33.3
5 to 6	0.0	0.0	0.0	0.0
7 to 8	0.0	0.0	1.4	1.4
9 to 10	0.0	0.0	0.0	1.4
Over 10	8.3	12.5	8.3	11.1
Total	100.0	100.0	100.0	100.0

As can be seen in table 6.13, among the 72 firms, 79.2 per cent (57 firms) had between one and four projects. Only 11.1 per cent (8 firms) had more than ten projects. However, 6.9 per cent (5 firms) indicated that they did not have any projects. The general impression gained from the above results is that many of the construction firms had a considerable workload in terms of the number of projects underway. However, the GCP (2003) pointed out that many construction contracts were suspended or had not started, owing to administrative and financial obstacles.

Furthermore, the information in table 6.13 shows that there is no significant difference between consultancy and construction firms in the trends of contracts and projects underway when the survey was conducted: more than sixty-six per cent (16 firms) of consultancy firms had signed between one and four contracts. However, only 2 (8.3%) had signed more than ten contracts, and 6 (25%) indicated that they had not signed any contracts in that year. Also, the findings show that, among the 24 consultancy firms 20 (83.3%) reported that they had between one and four projects underway at the time of survey, and only 3 (12.5%) had more than ten projects (see table 6.13). However, in comments supplied by managers, most projects were small in terms of both scale and value.

The increase in numbers of small firms in Libya can be attributed to the following reasons: Libya has limited human resources in terms of quantity and quality; its market is mainly fragmented into four separate small regional markets (see chapter three); and the privatization of large numbers of public companies (see chapters three and four). According to Reinecke et al (2004, p.), in most developing countries state-owned and public firms have been divided into small separate units or transformed into small and medium firms owing to the

inefficiency of state-owned enterprises, the sudden shrinkage in the numbers and role of state-owned public firms (see 4.3.3, 6.4.1 and 6.4.2), and the withdrawal of large foreign enterprises from the country in the 1980s and 1990s (see chapter four).

It is suggested that small firms (with annual turnovers of LD 500,000 or less, workloads of five projects or less, and employing less than ten permanent employees) are an appropriate mode of organization for the CI in Libya in terms of operations, employment and the development of regional and local society. This suggestion is reached for the following reasons: Libya has a limited workforce; a majority of projects are small in terms of size, particularly at local levels (see 7.1.3); Libya is divided into four separate, small construction markets, as addressed in chapter three; family and tribal structures are gnerally suitable for small firms (see 3.5.2, 6.4.1 and 6.4.4); and the subcontracting system is one of the main features of the operations of the LCI (see 6.5.2). However, despite the fact the LCI is dominated by small firms, it is argued that large firms, particularly in the construction sector, are of great concern in any nation's economy (Ofori, 1991, p.20).

6.5 The Resources of the Firms

Ngowi et al (2002, p.209) argued that the resources of firms are associated with the type of projects they construct. Therefore, respondents were asked to answer questions relevant to their key resources, including labour, funds for operations, construction equipment, management and training and subcontractors firms.

6.5.1 Permanent Employees

To explore the size of the permanent staff of firms in the LCI, respondents were asked to indicate the number of permanent employees in their firms. Figure 6.2 shows that the majority of the respondents' construction firms employed between one and eleven permanent employees. Fifty three (73.6%) firms employed less than eleven permanent employees, and only 6 (8.3%) employed more than 29 employees. This indicates that most firms are small. However, the average number of permanent workers in construction firms was 24 workers. It was also observed that state-owned and public companies employed more permanent staff. This is, in general, attributed to social and economic circumstances and employment regulations. Thus, these results indicate that, as in developed and other developing countries, the majority of construction firms employ few permanent staff (see 2.6.3). However, the definition of the term 'small' varies from one country to another, as mentioned in section 4.4.2.

Figure 6-2: Number of permanent employees in construction firms

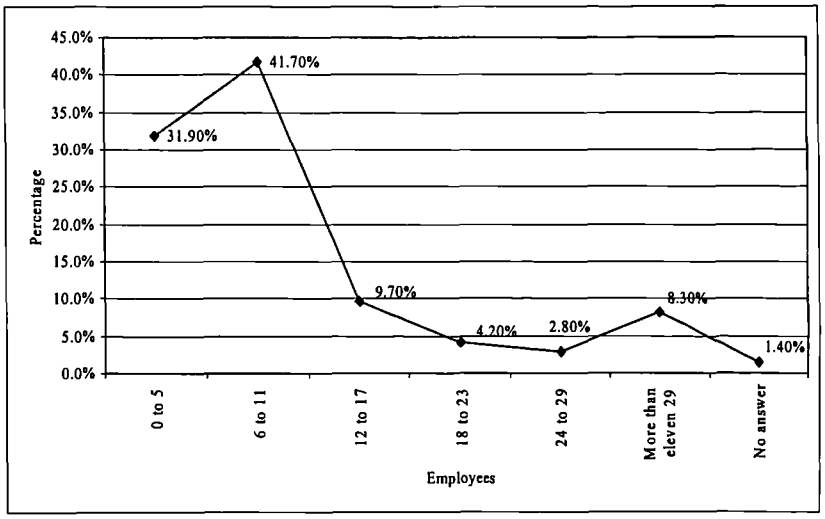
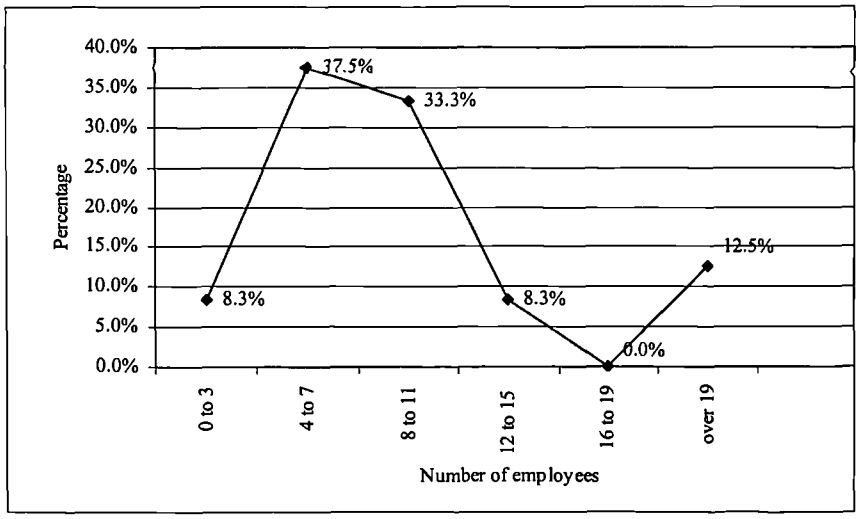


Figure 6.3 shows that a majority of consultancy firms 19 (79.1%) employed less than ten permanent employees; and only 3 (12.5%) employed more than 19 employees.

Figure 6-3: Number of permanent employees in consultancy firms



These results show that consultancy firms are also small in terms of the number of permanent employees. This may be because, according to Libyan law, consultants can work as part time employees in consultancy firms in the evenings. Also, one of the key features of design firms is that firms usually employ small numbers of employees (Otter et al., 2002, p.166).

From the above, it is clear that the vast majority of construction and consultancy firms in the LCI are small in terms of numbers of permanent employees. This may imply that these firms rely heavily on casual or informally employed construction workers, and

subcontractor firms. This will be discussed in sections 7.5.2 and 8.4.3. Furthermore, it is clear that the gap between small and large firms in terms of workload and number of permanent staff is large, as Ofori (1991, p.19) suggested.

To sum up this section, it can be said that, as the literature suggest, the number of small firms has increased remarkably in the LCI over the past decades (see 2.6.3). The LCI comprises a large number of small firms and a limited number of large firms. This situation also exists in both developed and developing countries; for example, the CI in the US comprises of 1.2 million firms, 80 per cent of which employ five persons or less (Michal, 1998, p. 27). Woudhuysen et al. (2004, p. 131) indicated that in the UK the CI is dominated by small firms (see 2.6.3). At the time of the study, small numbers of employees (see 6.5.1), light workloads and modest turnovers were key features of the construction and consultancy firms in the LCI. However, a large number of projects had not started or were suspended. This may imply that there were major obstacles constraining the operations of firms and project progress. These will be identified later in sections 7.4.6 and 8.2. Furthermore, it can be argued that the way in which projects are initiated and organized is likely to force firms to be overloaded; this is mainly because the state is the major clients of projects (see 7.1.1). Finally, these factors have influenced (and are influencing) operations. The industry lacks large firms which have the capability to cope with large national projects. However, one of the strengths of the LCI's structure lies in its large number of small firms.

6.5.2 Subcontractors

To explore the role of subcontractors in the LCI, respondents from construction and consultancy firms were asked a question requiring a 'yes/no' answer in order to identify the reliance of their firms on subcontractors. Most firms relied on subcontractors in their operations. Fifty-five (60.4%) of construction and consultancy firms indicated that they were contracted with subcontractor firms to undertake part or all of their last three projects. The remaining 37 firms (39.6%) said that they contracted out their own staff and workers.

To identify the key reasons underlying this phenomenon, the results of interviews conducted with site managers and comments of many of the respondent contractors and consultants suggest the following most important reasons: the low capability of firms; firms were small general contractors and consultants (see 6.4.4, 7.2.3 and 7.3.5); the

operating environment was insecure, and there was a lack of trust in the clients of projects. The general reasons underlying the reliance on subcontractors in the CI are highlighted in section 2.6.5.

In comments supplied by respondents from consultant and contractor firms, the following broad themes emerged. Most subcontractors supplied construction materials and labour and a large proportion of them were unregistered or informal. This is supported by the discussions in sections 2.3.5 and 4.6.2. Therefore, it can be concluded that a significant proportion of operations in the LCI are carried out by subcontractor firms.

In short, it can be said that, as in most countries (see 2.6.5), subcontractor firms have a key role in the operation of the LCI. This is mainly because the structure of the industry is dominated by general contractors; and firms have relatively short operational histories, limited experience, and low managerial, financial and technical capabilities. Three main types of subcontracting systems were recognized, including labour-only, materials and labour and materials subcontractors. This feature is one of the factors which affects the operations of the LCI and forms the overall shape of the LCI. Thus, subcontractor systems, agreements and relationships should be considered, assessed and developed.

6.5.3 Equipment and Machinery

In general, the use of construction equipment gives an indication of the nature of construction technology, operations and construction materials, the skills of workers, methods and construction technology used and the quality of the final products (see 2.7.4). Respondents from construction firms were asked a set of questions designed to collect information about the equipment used in the operations of their firms. Firstly, the respondents were asked if construction equipment was hired or if their own plant or machinery was used during the construction of their last three projects. The findings show that, among the 72 construction firms, 44 (61.1%) reported that they hired equipment, while of the rest 24 (37.5%) relied on their own machinery and equipment, and 4 (1.4%) did not answer the question. Some respondents from domestic partnership and cooperative firms confirmed that they hired equipment from public and foreign companies which are well supplied with construction equipment. Furthermore, all five construction firms visited insisted that they relied upon the hiring of construction equipment.

The findings give an indication that most of the firms lacked operational equipment. This is possibly because most firms were small in terms of numbers of employees, workload and turnover (see 6.4.5.). Added to this, they were relatively new firms in terms of date of establishment, as addressed in sections 6.4.1 and 6.4.2. Such firms lack the capital to purchase and invest in construction equipment. Thus, it is likely that the hiring of construction equipment is an important market in the LCI.

Respondents were then asked about the type of construction equipment they had employed in their last three projects and the results are presented in table 6.14. Nearly fifty-one per cent (110 projects) were constructed using small mobile concrete mixers, 23.1 per cent (50 projects) by manual mixing tools, 11.1 per cent (24 projects) were constructed by employing concrete pumps and associated tools, 9.7 per cent (21 projects) by operating central concrete mixers, and the remaining 5.1 per cent (11 projects) were constructed using cranes (see appendix E).

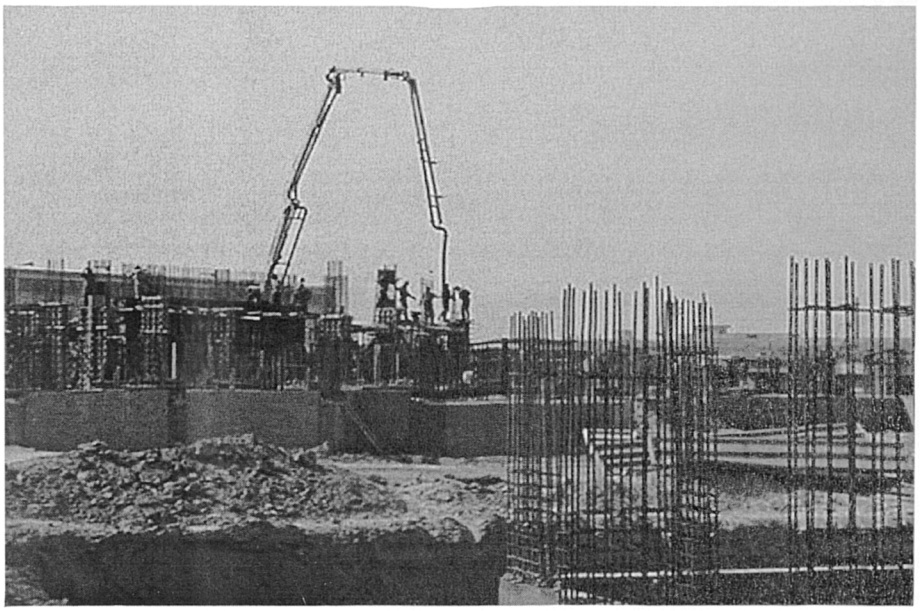
Table 6-14: Construction equipment used in construction of the last three projects

Equipment	First project n=72 (%)	Second Project n=72 (%)	Third project n=72 (%)	Overall n=216 (%)
Central concrete mixer	8.3	12.5	8.3	9.7
Small mobile concrete mixer	54.2	51.4	47.2	50.9
Cranes	4.2	2.8	8.3	5.1
Concrete pumps	13.9	12.5	6.9	11.1
Manual mixing methods	19.4	20.8	29.1	23.1
	100.00	100.00	100.00	100.00

From the above results and observations of construction firms, the following points can be made. Firstly, the construction equipment used in construction projects was related to the cement and concrete industry. The interpretation of this is that, the operations of the LCI are based on concrete technology and related products (see appendix E). This is supported by the discussion in chapter four and 8.2. Secondly, the majority of the industry's operations concerned low buildings, as only a few cranes were used. Thirdly, a significant proportion of concrete work was carried out by traditional craft skills and methods using mobile mixers and manual mixing methods. This situation exists in most developing countries (Wells et al, 2003, p.329). Furthermore, during visits to construction projects and firms, it was observed that the quality of concrete was poor. This is mainly because a significant proportion of concrete works were carried out using small mobile mixers and manual mixing methods. In this regard, Aitcin (2000, p.1349) argued that "modern concrete is more than simply a mixture of cement, water and aggregate". It was also observed that none of the construction

firms had used specific construction equipment or technology in their last three projects. This indicates that the construction market in Libya is dominated by concrete construction technology. Finally, generally, it can be said that the operation and production processes of the LCI rely largely on labour-intensive construction techniques (see chapter two and appendix E).

Figure 6-4: Production process of concrete in Taric Al-Mataar housing project



A manager at one of the five construction projects which was visited during the empirical study was asked about the main factors encouraging the hiring of construction equipment. He blamed shortages of spare parts, a lack of hard currency to import equipment and machinery, the lack of continuity of work, and the poor technical skills of workers. Furthermore, the market for hiring equipment is generally informal. Equipment, plant and machinery to be hired can be found near the pick-up points of informal construction workers at junction points and the crossings of main streets and squares in all cities and towns.

To sum up this section, four main points can be made. Firstly, construction firms in the LCI relied on the hiring of equipment to carry out their operations. Consequently, an informal market in hiring construction equipment is one of the features of the LCI. Secondly, construction equipment used in the LCI is related to the cement and concrete industry. Thirdly, the LCI is a cement-based industry, and its main processes and operations are generally organized around labour-intensive techniques. Fourthly, the majority of construction equipment, plant, machinery and their spare parts in Libya's construction market are imported. It is clear that, the nature of construction technology and

its associated equipment and plants is a key factor which forms the current shape of the LCI and its associated processes and operations in terms of materials, skills, construction duration, cost, management of national limited resources such as water, and the final product.

6.5.4 Management and Training

To identify the role of training in construction in the strategies of consultancy and construction firms, respondents were asked two questions about the training courses organized by their firms over the past three years. The findings showed that, among the 72 construction firms, 55.6 per cent (40 firms) reported that they organized training courses for staff, while the rest did not. More than sixty-two per cent (15) of consultancy firms indicated that they organized training courses for their staff, while 37.6 per cent (9 firms) did not. The results indicate that training was considered significant by many firms. The comments of some respondents indicated that most training courses were organized and carried out by government training centres or public companies. This supports the findings in section 6.3.2 which indicated that the public sector played an important role in training the current construction leaders in the LCI.

The respondents were also asked to describe the types of training courses, and the results are presented in Table 6.15. More than fifty-two per cent of the training courses were related to computing, 16.4 per cent were related to project management, 14.5 per cent of the courses concerned administrative and managerial skills.

Table 6-15: A breakdown of training courses

Training courses	Contractors n=72 (%)	Consultants n=24 (%)	Overall n=96 (%)
Computer	52.50	53.33	52.7
Administration	20.00	0.00	14.5
Project management	12.50	26.67	16.4
Construction technology	5.00	0.00	3.6
All of above	10.00	20.00	12.7
	100	1000	100

Thus, most training courses focused on computing. This is considered as a positive point for training. In addition, it is also evident that most of the courses were devoted to administrative and theoretical subjects. However, observations during visits to construction and consultancy firms, and while administering the questionnaires, showed that computers were only used for routine typing. In turn, it was observed that the majority of consultancy

firms used computer-aided program in their operations. Furthermore, at the time of this study, there were a remarkable number of training centres, other institutions and university courses relevant to construction (see 4.7). However, most post-graduate qualifications relevant to the CI were achieved abroad (see 6.2.4).

During visits to five construction firms and two consultancy firms (see 5.7.3), it was observed that the management of the majority of these firms was based on the People's Committee of the Company (PCC), which was responsible for company strategy and management affairs. The committees were usually selected by all partners in the company, and comprised five partners. In this type of management, the manager is known as the Secretary of the People's Committee of the Company. However, it was observed that the general manager of the firm was usually one of the partners or a relative. Informal discussions with managerial teams in these firms led to the conclusion that management systems in these cases could be characterized by several points: firstly, there is no clear structure for the firm at either organizational and project levels; secondly, most managers have little or even no formal training in construction management, as evidenced in sections 6.2.4 and 6.3.2; thirdly, there was a lack of well-defined management job descriptions and responsibilities; and fourthly, managers were affected by tribal pressures and social nepotism. It must be said that, in general, management systems lack efficient decision-making and accountability.

Training in construction in Libya has received considerable attention by the state and public companies over the past decade. However, most of the current training efforts focus on theoretical, administrative and theoretical subjects, leading to the suspicion that current training progrmmes in construction may be inappropriate. Moreover, the findings in sections 4.5.1, 6.3.2 and 6.2.4 showed that there are many overall weaknesses in human resources in the CI. These include acute shortages of skilled workers such as bar benders, bricklayers, carpenters, plasters, floorers, painters, plumbers, electricians and plant and crane operatives as well as managers and experts. In addition, most firms in the LCI lack clear and efficient management systems. These are considered as important factors which have affected the operation of the LCI and formed its current shape. Thus, it is argued that a strong commitment to education and training in construction is required. Many researchers, such as Agapiou et al. 1998, Agapiou, 1999, Bubshait et al., 1996; Nogowi, 1997; Adams, 1998; Addo-abedi, 2000; English, 2000, Muya et al., 2006), have confirmed

that regular and continuing training, as well as postgraduate training, has a significant role in improving the efficiency of managerial and operational staff in the CI.

6.6 Summary and Conclusion

The aim of this chapter has been to present the study's findings relevant to the main general characteristics of actors in the LCI (consultants, contractors and clients), and the key features and resources of the consultancy and construction firms, in order to answer some of the research sub-questions relevant to the way in which the LCI is organized, the general characteristics of people involved in the CI and the features and resources of firms. Generally, some of the key factors which have affected (and are affecting) the current operations of the LCI and formed its overall picture are addressed.

Therefore, the chapter has identified and reported the empirical findings regarding these issues. The findings show that the LCI is dominated by men, with women scarcely represented in the industry. Young actors (contractors, consultants and clients) aged between 25 and 49 dominate the industry and its associated firms. Surprisingly, a majority of actors are relatively well educated. However, most contractors had only intermediate educational levels and relied on experience to gain knowledge and qualifications in construction, as in most developing countries. The strength of the industry lies in its educated and well qualified clients, consultants and contractors.

Surprisingly, a majority of key actors in the LCI had considerable personal and practical experience in working in the CI and its related sub-sectors. Most current managers and leaders of firms in the LCI were trained and skilled in the public construction sector of the 1970s and 1980s. So, despite the public construction sector failing to meet national construction requirements, it has had a vital role in training the current actors in the LCI. It is argued that the principles and culture of the public sector affects the operations of the industry. Added to this, the findings showed that most current actors are relatively stable in their firms, owing to their administration and ownership structure. Also, the three most dominant reasons motivating Libyans to work in construction were their qualifications and experience in construction, and because construction is regarded as a highly profitable business. This can be considered as a strength in the LCI.

The findings confirmed that, at the time of this study, the establishment of firms was controlled by socialist and partnership principles. Consequently, the majority of the firms were established by a group of partners. No one-man firm was found in the formal LCI at the time of this study. This may be considered as one of the unique features of the LCI. The majority of consultancy and construction firms in the LCI started operating after the beginning of the 1990s, for political and economic reasons. Consequently, these firms have a short history, limited operational experience and lack physical and human capital. These factors have affected the operations of the LCI in terms of planning, structure and management. At the time of this study partnership and cooperative family firms dominated in the LCI. A majority of these firms complied with the registration laws. In addition, the CI comprises a large number of small and medium firms and a small number of large firms in terms of employees and turnover. Surprisingly, the empirical findings revealed that the numbers of public and foreign firms were very small, probably due to state policies in privatizing the public sector and encouraging the local construction industry. In addition, most of the firms had considerable workloads. However, government follow-up reports indicate that many of these projects were suspended. This may indicate that the operations of the CI were restricted by administrative and technical obstacles.

Most of the firms employed small numbers of permanent employees. Also, subcontractors have a key role in the operation of the LCI, as in most countries. The operations of construction firms in the LCI heavily depended on the hiring of construction equipment, and the market in hiring construction equipment and machinery is thus of some significance in Libya's construction industry. One of the interesting findings of the empirical study is that most construction firms hired and used equipment related to concrete construction technology. This confirms that the operations and production processes of the LCI are based on the cement and concrete industry and are generally organized around labour-intensive methods. Added to this, many firms consider training as an important issue in their strategies. However, most training courses were focused on theoretical and administrative skills. Thus, cement and concrete technology determines, in part, the nature of the operations of the LCI in terms of planning, management, materials, skills, equipment and plants, cost and construction duration, as well as forming the overall shape of the industry in terms of its structure and final products.

Chapter Seven

7 General Characteristics of Construction Projects

The preceding chapter has presented the study's findings relevant to the general characteristics of key actors and identified the features and resources of firms in the Libyan construction industry (LCI). The aim of this chapter is to present the study's findings relevant to construction projects in the LCI. The chapter has five main sections. The first section identifies the general characteristics of construction projects. Section two explores the pre-contracting phase and design processes. Section three identifies the tendering and contracting processes. Section four explores the production processes; and the chapter closes with a summary and concluding points.

7.1 General Characteristics of Projects

The respondents were asked a number of questions about the clients and the types and sizes of their last five projects. However, the majority of respondents provided data about only three projects, owing to technical and administrative difficulties. Consequently, the analysis and discussion in this chapter are based on data relevant to these projects.

7.1.1 Clients of Projects

The respondents from construction and consultancy firms were first asked to indicate the clients of their last three projects. Table 7.1 shows a breakdown of the clients of these projects.

Table 7-1: Construction projects by clients

Clients of project	First project n= 12 (%)	Second Project n=12 (%)	Third project n= 12 (%) (%)	Overall n= 36 (%)
Local government	61.1	54.2	48.6	54.6
Public companies	20.8	23.6	34.7	26.4
Central government	12.5	13.9	6.9	11.1
Private sector	2.8	6.9	8.3	6.1
Others	2.8	1.4	1.4	1.9
Total	100.00	100.00	100.00	100.00

As anticipated, at the time of the study, the state was the major client of construction projects. 45.6 per cent (118 projects) of the total projects undertaken by construction firms were owned by local government, 26.4 per cent (57 projects) by public companies and establishments, 11.1 per cent (24 projects) by central government and its departments, 6

per cent by the private sector and only 1.9 per cent (4 projects) by other clients such as non-government organizations.

Table 7.2 shows that 33.3 per cent (24 projects) of the last three projects of consultancy firms were owned by public companies and establishments, 29.2 per cent (21 projects) by local government, 19.4 per cent (14 projects) by the private sector, and 18.1 per cent (13 projects) by central government.

Table 7-2: Clients of design projects

Clients of project	First project n= 24 (%)	Second Project n= 24 (%)	Third project n= 24 (%)	Overall n= 72 (%)
Local government	29.2	33.3	25.0	29.2
Public companies	20.8	41.7	37.50	33.3
Central government	33.3	12.5	8.3	18.1
Private sector	16.7	12.5	29.2	19.4
	100.00	100.00	100.00	100.00

As can be seen in the above tables, the major clients of consulting and construction projects were local and central government, and public companies and establishments. These results support the discussion in chapters three and four which indicated that the state has a dominant role in social and development plans in Libya. The World Bank (1984, p.39-40) indicated that in oil producing Arabic countries such as Kuwait, Libya and Saudi Arabia, governments played a dominant role in creating construction demand. Thus, the operations of the LCI are heavily dependent on state financial development policies, budgets and levels of spending on construction.

Furthermore, it has been observed that most projects for individuals are constructed by small local and informal firms. Also, the results confirmed that the private sector plays an insignificant role in construction investment. This can be attributed to the state's policies of the 1980s and 1990s in housing and construction activities (see chapters three, four and appendix B). So that the NCID survey of the workforce in Libya showed that only 21.6 per cent of the total active workforce was working in the private sector or as self-employed (NCID, 2001, p.35). The follow up reports of the General Council for Planning in 2000, 2001, 2002 and 2003 showed that the vast majority of formal construction projects are initiated, managed and supervised by local governments. This can be regarded as a weakness in the operations of the LCI in terms of planning and finance.

ANOVA statistical analysis at the 5% significance level did not show any significant difference between construction and consultancy firms in the clients of the last three construction projects (the F ratio is 2.563, with a significance level of 0.790).

To sum up this section, it can be said that the state is the major client of consulting and construction projects; the private sector has a relatively marginal role in formal construction investment, because of political and economic policies. This leads to the conclusion that, the state has a strong effect on the operations of the LCI in terms of the ownership and scale of projects. Conclusion and recommendations in this regard are provided in chapter nine.

7.1.2 Types of Projects

To identify the types of construction projects undertaken at the time of this study, the respondents from clients, consultants and construction firms were asked to mention the types of their last three projects.

For clients the findings showed that 30.6 per cent (11 projects) of the total number of projects were residential buildings, 27.8 per cent (10 projects) were non-residential or other buildings, 22.2 per cent (8 projects) were infrastructure, 13.9 per cent (8 projects) were maintenance and repair work, and the remaining 5.6 per cent (2 projects) were other construction works such as modernization, demolition and alterations.

Table 7-3: A breakdown of construction firms' projects

Type of construction projects	First project n=72s (%)	Second Project n=72 (%)	Third project n=72 (%)	Overall n= 216 (%)
Residential buildings	15.3	25.0	18.1	19.4
Non-residential buildings	23.6	22.2	23.6	23.1
Infrastructure projects	38.9	26.4	36.1	33.8
Maintenance and repair	12.5	16.7	13.9	14.4
Others	8.3	6.9	5.6	6.9
No answer	1.4	2.8	2.8	2.3
Total	100.00	100.00	100.00	100.00

The results show that more than 58 per cent of the total numbers of projects were buildings rather than infrastructure works. This may indicate that the structure of demand for construction works is dominated by building work (see 2.1.2). However, the results should be interpreted with some caution when considering the value of projects, as the value of infrastructure projects was usually higher.

The above results are confirmed by the findings obtained from construction firms (see table 7.3). More than 42 (92 projects) of the total number of projects undertaken by construction firms were buildings, more than 33 per cent (73 projects) infrastructure projects, and 14.4 per cent (31 projects) were maintenance and repair projects.

It is evident that the structure of projects compromises a large number of buildings and infrastructure projects and a small number of maintenance and repair works. Furthermore, the respondents from consultancy firms were also asked to break down the types of their last three projects. Table 7.4 shows that 74.9 per cent (54 projects) of the consultancy firms' projects were design and supervision.

Table 7-4: Types of consulting projects

Type of consulting projects	First project n= n= 24 (%)	Second Project n= 24 (%)	Third project n= 24 (%)	Overall n= 72 (%)
Design	50.0	41.7	45.8	45.8
Supervision	29.2	25.0	33.3	29.2
Project management	12.5	16.7	12.5	13.9
Planning	4.2	12.5	0.0	5.6
Consulting studies	4.2	4.2	8.3	5.6
Total	100.00	100.00	100.0	100.0

Few projects were related to management and consulting studies. Most projects involved design and supervision. It can thus be inferred that designers have a traditional role in the CI and its associated processes and operations (see 2.6.2 and 2.8.1). This confirms the findings in sections 7.2.4, 7.2.5 and 7.3.6 which indicate that the construction processes and operations in the LCI are separated into design, construction and supervision. This is considered as one of the weaknesses in the current operations of the LCI.

The ANOVA statistical analysis shows that that there is no significant statistical difference in the types of the last three construction projects (the F ratio is 0.402 and the recorded significance level is 0.669). Thus, there are five types of construction projects: residential and non-residential buildings, infrastructure works, maintenance and repair works and other specific projects such as modernization, demolition and alterations. The vast majority of projects in terms of number are buildings and infrastructure; there are relatively few maintenance and repair projects. These types have affected the current operation and shape of the LCI in terms of type and size of firms, scope of firms' activities and construction equipment (see 6.4.3. 6.4.4, 6.4.5 and 6.5.3). However, a review of

construction contracts signed in 2003 in Tripoli Shabia (municipality) indicated that demand for maintenance and repair work will increase in the near feature, mainly because a large number of buildings and infrastructure works which were constructed in recent decades will soon require repair. This issue should be considered in construction policies, training and construction investment.

7.1.3 Size of Projects

Respondents from consultancy and construction firms were asked about the value of their last three projects (for construction only). It should be mentioned that a significant number of respondents did not answer this question. This might because Libyans are highly sensitive about providing information about their business or it may be attributed to personal and administrative circumstances, as mentioned in section 5.5.6 and 6.4.5. Table 7.5 shows a breakdown of the value of the initial contracts of the construction firms.

Table 7-5: A breakdown of the value of construction projects by LD thousands.

Value of project (LD ,000)	Value of project (US $,000)	First project n=72s (%)	Second Project n=72s (%)	Third project n=72s (%)	Overall n= 216 (%)
0-100	Less than 70	8.3	4.2	5.6	6.0
101-200	71-141	20.8	22.2	18.1	20.4
201-300	142-211	15.3	13.9	16.7	15.3
301-400	213-281	18.1	13.9	12.5	14.8
401-500	282-352	11.1	11.1	15.3	12.5
501-600	353-423	4.2	1.4	1.4	2.3
601-700	424-492	2.7	2.8	0.0	1.9
701-800	493-563	0.00	1.4	2.8	1.4
801-900	365-634	2.8	4.2	2.8	3.2
901-moillion	635-million	2.7	4.2	2.8	3.2
More one million	More one million	6.9	8.3	11.1	8.8
No answer	No answer	6.9	12.5	11.1	10.1
Total		100.0	100.0	100.0	100

As can be seen, sixty nine per cent (149 projects) of the last three projects (construction only) were between zero and LD 500,000 (at the time of the study the exchange rate was one US $ = 1.42 LD), 20.4 per cent (45 projects) ranged between values of LD 501,000 and one million, and only 8.8 per cent (19 projects) had values of more than one million. No information was provided about 10.1 per cent (13 projects). This may indicate that the systems used for collecting, storing and categorizing data and information about projects are inadequate.

The above results indicate that construction projects were generally small in terms of values of the initial contracts. This is possibly because most projects were at local level,

funded and owned by local government (see 7.1.1). Added to this, local governments tend to divide large projects into stages or small projects in order to overcome the restrictions of the GPCPBC, which allows local governments to sign a construction contract only if its value is less than LD 500,000 (GCP, 2000b, p.15). However, the follow-up report of the General Council for Planning (2002c and 2003) revealed that, in general, national projects were large (more than one LD million), while regional and local projects are generally small in terms of value.

Respondents from construction firms were also asked whether they had completed their last three projects without any increase in the value of the original contracts. Nearly sixty per cent (123 projects) were completed within the contract value, while in 40.2 per cent (87 projects) the final value exceeded the original contract value (no information was provided about 6 projects). These findings show that a large number of projects required additional contractual orders to be completed. This indicates that the estimating process for the costs of construction projects might be deficient owing in, part, to incomplete project documents, changes in design and clients as well as inflations (see 2.8.1 and 7.3.3). Thus, it can be said these results are indicative of overall weaknesses in the LIC's pre-contracting processes in terms of planning and estimation processes (see 2.8.1).

To address the above phenomenon, the financers, decision makers and site managers interviewed were asked why the final value of the contracts exceeded their original value. The five most important causes were incomplete contract documents, inflation and instability in exchange rates, delays in payments to contractors, and delays to projects. These reasons were also identified by respondents when asked about the key causes of changing designs, inaccurate estimates and delays to projects (see 7.2.5, 7.3.3 and 7.4.6). Therefore, weaknesses in construction and projects management are, in part, one of the key factors which affects the current operations of the LCI. Key conclusions and recommendations regarding these issues are suggested in chapter nine.

The respondents from consultancy firms were asked the same question and table 7.6 provides a breakdown of the value of projects (for design only). The value of 80.6 per cent (58 projects) of the last three projects was less than LD 500.00, more than eight per cent (6 projects) were between LD 501,000 and one million and only one project (1.4%) was valued at more than LD one million. No information was provided about 11.1 per cent (8 projects) of the projects.

Table 7-6: A breakdown of the value of consultancy project by L.D. thousands

Value of project (LD ,000))	Value of project (US $,000)	First project n= 24 (%)	Second Project n= 24 (%)	Third project n= 24 (%)	Overall n = 72 (%)
0-100	Less than 70	33.3	29.2	37.5	33.3
101-200	71-141	25.0	41.7	20.8	29.2
201-300	142-211	12.5	8.3	12.5	11.1
301-400	213-281	4.17	4.17	12.50	6.9
401-500	282-352	0.0	0.0	0.0	0.00
501-600	353-423	4.2	0.0	0.0	1.4
601-700	424-492	3.1	1.1	4.2	2.8
701-800	493-563	4.2	0.0	0.0	1.4
801-900	365-634	0.0	0.0	0.0	0.0
901-moillion	635-million	0.0	0.0	4.2	1.4
More one million	More one million	0.0	4.2	0.0	1.4
No answer	No answer	12.5	12.5	8.3	11.1
Total		100.0	100.0	100.0	100.0

From the above results, it is clear that the majority of consultants' projects were small in terms of value. This is supported by the findings in section 6.4.4, and is possibly because of the nature of the consulting business. In addition, the size of construction projects is restricted by geographical, demographic, legal and administrative factors (see chapters three and four).

Thus, at the time of the study, construction projects were supplied by four channels: local domestic construction firms, foreign and joint-venture companies, public companies and organizations, subcontractor firms, and owner-builders (see 7.3.5). Generally, small and medium projects were conducted by local contractors, while large infrastructure and sophisticated building projects were mainly undertaken by foreign and joint venture companies. In this regard, Adams (1997, p.95) indicated that in most developing countries large projects were monopolized by foreign companies. Thus, it can be said that, the low capability of the LCI to undertake and manage large projects can be regarded as one of the weaknesses in the LCI.

7.2 Pre-contracting Phase

As mentioned in section 2.8.1, vital decisions are made in the pre-contracting phase. Therefore, to explore the organizational patterns of pre-contracting processes in the LCI, the respondents were asked a number of questions designed to compile information about the main sources of funding of construction projects, the selection and nationality of designers, and some important aspects of design processes.

7.2.1 Sources of Finance

The respondents from construction firms and clients were asked a set of questions designed to elicit information about the provision of funding in the LCI, and to identify the role of public and private clients and the ways by which firms funded their regular operations. The data in table 7.7 indicates that 54.6 per cent (118 projects) of the last three projects of construction firms were funded by direct advance payments and regular payments by clients of the projects, while the remaining was funded by banks loans, partners' company savings and combinations of several sources.

Table 7-7: A breakdown of funding sources of construction projects by construction firms

Funding sources	First project n=72 (%)	Second Project n=72	Third project n=72	Overall n= 216(%)
Payments by clients	52.8	54.2	56.9	54.6
Bank loan	15.3	9.7	11.1	12.0
Company's saving	9.7	11.1	8.3	9.7
Partner's saving	8.3	9.7	11.1	9.7
Combination of sources	13.9	15.3	12.5	13.9
Total	100.0	100.0	100.0	100.0

When the clients were asked the same questions, more than 52 per cent (19 projects) of projects were funded by direct advances and regular payments to contractors (see table 7.8). Furthermore, the contribution of banks and other financial agencies in funding construction is very low. This finding is backed by those in sections 7.1.1 and 7.4.6 which indicated that the major client of construction projects is the state, and delays in payments by clients to contractors are a major cause of delays to projects. In such a financial environment, the state's budget and level of spending on construction has a direct influence on construction activities and projects which are financed by advances and regular payments of contractors' invoices (World Bank, 1984, p.75).

Table 7-8: A breakdown of sources of the funding of construction projects by clients

Funding sources	First project n=12 (%)	Second Project n–12 (%)	Third project n= 12 (%)	Overall n= 12 (%)
Payments by clients	58.3	50.0	50.0	52.8
Personal savings	8.3	0.0	0.0	2.8
Company's investment	8.3	16.7	16.7	13.9
Bank loans	25.0	0.0	8.3	11.1
No answer	0.00	33.3	25.0	19.4
Total	100.0	100.0	100.0	100.0

In discussing the reasons underlying the low level of contribution and collaboration between the CI and commercial banks, one key senior manager in one of the important

commercial banks in Tripoli city attributed this phenomenon, in general, to four reasons. Firstly, most firms are small and unstable in terms of workload, turnover and available capital. Secondly, most formal construction projects are owned and funded by the state. These views are supported by the findings in section 6.4.5 and 7.1.3. Thirdly, most managers and partners in construction firms are not interested in obtaining bank loans or credit owing to cultural values (Islam prohibits dealing in any business based on interest rates). Fourthly, a large number of the most important commercial banks are owned and operated by the state. It should be mentioned that, at the time of this study, there were no special banks or lending agencies with a direct connection to the CI. The Bank of Savings and Real Estate was the only commercial bank which was concerned with investment in construction, and particularly housing construction.

To sum up the findings in this section, it can be said that traditional funding patterns organized around direct payments by clients are dominant in the financial environment of the LCI. Most construction projects relied upon advances and direct payments by clients. At the time of this study, banks and other financial institutions made only a modest contribution to funding construction projects and the operations of construction firms, for a variety of organizational, cultural and administrative reasons. Thus, to improve the provision of funding in the LCI, a set of recommendations is suggested in chapter nine.

7.2.2 Selection of Designers

As discussed in section 2.6.2, design decisions have a tremendous influence throughout a project's lifecycle, and the selection of designers is a crucial factor in the success of the overall construction process. Therefore, the clients of construction projects were asked to mention the main criteria they considered when choosing a designer for a project. The findings showed that 38.9% of designers of the last three projects (36 projects) were selected because of their reputation, as determined by the size and range of previous projects, financial stability, staff qualifications and experience, positive references from previous clients, and their general experience profile. 27.8% of the designers were chosen through a set of considerations including friends' recommendations, and the designers' technical, financial and managerial resources; two (5.6%) of the designers were chosen from friends' recommendations; 11.1% on the duration of time needed to complete the design; and 16.67% on the resources and technical capabilities of the designer.

The value of a bid, experience, reputation, time and technical, managerial and financial factors are the most important considerations for clients when selecting designers. These findings indicate that the selection of a designer or a consultancy firm by a client is generally based on the rules of competitive bidding. In addition, the delivery of construction projects is organized around a fragmented approach where designers are only concerned with the conceptual and design phases of a project (see 2.8.2 and 7.3.4).

In brief, the selection of designers in the LCI is in general based on competitive processes in which the design and construction phases are separated. This traditional process is seen as one of the weaknesses in the operation of the LCI in terms of planning, structure, management and construction duration. Therefore, recommendations are suggested in chapter nine to increase integration between design and construction.

7.2.3 Nationality of Designers

To identify the general situation in the consulting sector, clients were asked to mention the nationality of the designers of their last three projects. More than sixty-six per cent (24 projects) of the projects were designed by Libyan consulting offices and firms, while the other 33 per cent (12 projects) were designed by foreign firms. The results show that most consulting works were carried out by Libyan firms at the time of this study.

However, from the previous experience of the current researcher and a range of observations during this study, it appears that most large and complicated buildings, industrial projects, oil industry and infrastructure projects were designed by foreign consultancy firms. This is possibly because Libyan consulting offices and firms lack experience in such work and have low technical experience (see chapter four). This is backed up by the findings in section 8.2.3, where the clients of construction projects considered inexperienced consultancy firms as one of the obstacles which restricted their practices.

From the above, it can be said that a large proportion of design and consulting works is conducted by Libyan designers, particularly of small and medium projects. However, large and sophisticated infrastructure projects are designed by foreign consultancy firms.

7.2.4 Contracting Methods for Design Work

The term contracting method in this context is defined as in Cox et al. (1998, p.71) as: "the way by which design and construction works are procured". To identify the main trends in design contracts in the consulting sector, the respondents from consultancy firms were asked to indicate the type and scope of work of their last three projects. The responses are presented in table 7.9. 45.8 per cent (33) of the contracts were carried out as a complete package including all contract documents, 25 per cent (18 contracts) were architectural design only, 18 per cent (13 contracts) were structural design and 11.1 per cent (8 contracts) were supervision only.

Table 7-9: Types of design contracts

Types of design contracts	First project n=24 (%)	Second Project n=24 (%)	Third project n=24 (%)	Overall n= 72 (%)
Complete package	45.8	62.5	29.2	45.8
Architecture	25.0	16.7	33.3	25.0
Structure	12.5	16.7	25.0	18.1
Supervision	16.7	4.2	12.5	11.1
Total	100.0	100.0	100.0	100.0

Thus, most contracts were carried out on the basis of a complete package of both architectural and structural design. In addition, there is a separation between architectural, structural and electrical design, which implies that the design process itself is fragmented into many phases. This may be attributed, in part, to the clients' objectives and experience. To clarify this, some of the clients were asked to describe the contracts they had signed with designers. A significant number indicated that they contracted with more than one designer to carry out architectural, structural, electrical, mechanical works, etc. One private client said: "I appointed a designer to carry out architectural design. Then, I searched for an experienced structural engineer to prepare the structural design of the project, and finally electrical and mechanical works were undertaken by other specialist engineers". He indicated that these sequential phases saved money and allowed him to select experienced designers.

In short, the empirical findings in this section show that the complete design package is the most frequent type of design contract in the LCI. However, surprisingly, it is also clear that a large number of design projects are fragmented into several sequential phases, in general for economic and technical reasons. This is likely to be one of the causes of delays to projects (see 7.4.6).

7.2.5 Design Aspects

The clients of construction projects were asked a number of questions concerning important design aspects in the LCI such as the duration of the design stage, ways of paying designers' fees, and their satisfaction with the designs of projects. Furthermore, some of those interviewed were asked questions with the aim of identifying major common deficiencies in the quality of design works.

The clients of projects were asked to mention the average length of duration of the design process (i.e. the time taken to design the project) in their last three projects. As can be seen in table 7.10, more that 69 per cent (25 projects) of the last three projects of the clients were designed in periods of between one and nine months. This may indicate that designers did not give enough time to the design. Only 19.4 per cent (7 projects) were designed in periods of between ten and twelve months and 11.1 (4 projects) more than twelve months, and only 5.6 per cent (2 projects) between one and three months (see table 7.10).

Table 7-10: Design duration

Duration of design process (months)	First project n= 12 (%)	Second Project n= 12 (%)	Third project n= 12 (%)	Overall n= 36 (%)
1-3	8.3	8.3	0.0	5.6
4-6	25.0	33.3	16.7	25.0
7-9	33.3	41.7	41.7	38.9
10-12	25.0	0.0	33.3	19.4
over 12	8.3	16.7	8.3	11.1
Total	100.0	100.0	100.0	100.0

Clients were also asked how they paid designers. They pointed out that the fees of 58.3 per cent (21 projects) of the last three projects were paid as a percentage of the initial estimated costs of projects, 25 per cent (9 projects) were paid per square metre (for buildings projects), no information was provided for 11.1 per cent (4 project), and 5.6 per cent (2 projects) were paid with a lump sum. The results revealed that most fees for designers were paid as a fixed percentage of the initial estimated cost of projects. This system may be criticized because designers do not then give enough consideration to reducing the initial costs of projects (Wells, 1986, p.83).

As discussed in section 2.8.1, the inadequacy of project briefings and changes in designs made by clients are common deficiencies (see 2.8.1). Clients were asked if they made any significant changes in the design of their last project during production

processes. 58.3 per cent (7 clients) said that they did, while the other 41.8 per cent (5) did not (see table 7.11).

Table 7-11: Main causes of changing the design of projects

Duration of design process (months)	First project n= 12 (%)	Second Project n= 12 (%)	Third project n= 12 (%)	Overall n= 36 (%)
Inappropriate design	25.0	8.33	8.3	13.9
Mistakes in drawings	33.3	16.67	8.3	19.4
Deficiencies in cost of project	0.0	0.0	16.7	5.6
Change in the client of project	0.0	8.3	0.0	2.8
Change in function	0.0	0.0	0.0	0.0
No changes	43.6	64.8	66.7	58.3
Total	100.0	100.0	100.0	100.0

This result gives a strong impression that changing elements of design is a common practice in the LCI. To explore the general causes of this trend, the clients were asked to indicate why they changed elements of design in their last three projects. Inappropriate and unclear design documents and drawings were the most important reasons (see table 7.11).

These results imply that lack of buildability (see 2.8.1) was the most important cause, which is backed up by the findings in section 7.3.6. Furthermore, poor project briefings owing to inefficient communication and information systems might be one of the causes of the poor buildabilty of design documents (see 7.3.2 and 7.4.1). On the other hand a large number of the clients were, to some extent, dissatisfied with the designers. These factors are considered as weaknesses in the LCI's pre-contracting and design processes which have restricted (and are restricting) the current operation of the LCI (see 7.3.1). Defective design is considered one of the key causes of delays to projects and increasing project risk (see 2.8.1 and 2.8.2). A recent survey of Japan's construction industry carried out by Minato (2003, p 545) found that defective design problems are a critical, complex and deep problem in both Japan's and the international industry. He argued that this problem can be managed by enabling clients and designers to realize the root causes of defective design. In addition, he argued that reductions in design fees and limited time given for the design phase are the most important causes of low quality in design documents.

To identify whether the consultancy firms were aware that clients changed their designs, they were asked about this issue. More than thirty-three per cent agreed that clients made changes, while the remaining 62.5 per cent said they did not. From the comments of many of the consultants, the inability of clients to state their construction needs and requirements, the incapability of local contractors to deal with design elements, and the

costs of projects, were the most important reasons for changes in designs from the point view of the designers. In addition, site managers were asked about the key causes of changes to designs during production processes. Their replies revealed that errors in design documents, clients changing their minds, changes in the function of a project, late delivery of imported materials, a lack of professional staff, and a lack of materials in accordance with project specifications are the most important causes.

The above findings lead to the conclusion that design and contractual documents in the LCI lack buildability. Thus, more concerted attention should be devoted to improving the efficiency of the pre-contracting and design processes. A set of recommendations in this area given in chapter nine.

7.3 The Tendering and Contracting Phases

To explore the current tendering and contracting systems in the LCI, and to identify their strengths and weaknesses and impact on construction processes and the operations of the industry, the respondents were asked a number of questions relevant to their role in the construction processes, sources of and access to information about projects, the estimation processes of projects' initial costs, methods of selection of contractors, nationality of contractors, and contracting methods. This section provides the empirical findings regarding those aspects.

7.3.1 Role of Contractors

Respondents from construction firms were asked to indicate their main role in their last three construction projects. Table 7.12 displays the findings, and it can be seen that the key role of the firms concerned construction only in more than 87 per cent (188 projects) of the last three projects. About 4.2 per cent (9 projects) were design and build, 1.9 per cent (4 projects) were design, build and operate, and the firms pointed out that in 4.2 per cent (9 projects) they had many roles.

From the results, it is clear that the majority of construction firms had a traditional role in the construction processes of the CI, in which they were only responsible for physical construction activities or the production phase (see 2.6.2). These results support the findings in sections 6.4.3, 6.4.4, 7.3.6, 8.2 and 8.3 which indicate that the majority of projects were managed by traditional construction procurement systems (see 2.8.2). However, construction firms in Libya should provide more than construction, as Ofori

(1994b) and Hillebrandt (1990) have suggested (see 2.6.2). In order to ensure an active role of construction firms in particular, it is essential to improve management patterns, as Minato (2003, p.545) stressed.

Table 7-12: Role of contractors in the construction processes

Role of construction firms	First project n= 72 (%)	Second Project n= 72 (%)	Third project n= 72 (%)	Overall n= 216 (%)
Construction only	90.30	83.33	87.50	87.04
Design and build	2.80	5.56	4.17	4.17
Design, build and operate	2.80	1.39	1.39	1.85
Others	1.40	4.17	2.78	2.78
No answer	2.70	5.56	4.17	4.17
Total	100.0	100.0	100.0	100.0

Furthermore, when clients were asked to mention their main role in their last three projects, the responses confirmed the above findings and revealed that their key role was providing the project brief, the selection of designers and contractors, and determining the procurement system in 34 projects (94.4%) of the 36 projects, while in the other 2 projects (5.6%) they had different roles. These results agreed with the responses of construction firms regarding this question.

The ANOVA statistical analysis shows that, at the 5% significance level, there is no significant statistical difference in the roles of firms in their last three projects (the F ratio is 0.909 and the observed significant level is 0.405). This confirms that traditional procurement systems are dominant in the delivery of construction projects.

From the above it is clear that, at the time of the survey, construction firms had a traditional role in the whole construction process in that they were not concerned with design. Thus, it can be said that this is an indication of weaknesses in the LCI's procurement systems. A majority of projects are organized around traditional procurement methods (see2.8.2).

7.3.2 Information about Projects

As highlighted in section 2.8.1, the CI depends on the analysis of data and information. Therefore, successful decisions by managers are based on efficient information in terms of quantity, quality, flow and timing. To explore this issue empirically in the LCI, the respondents from construction and consultancy firms were asked about their main sources of information in their last three projects. As can be seen in table 7.13, the

respondents from construction firms indicated that they obtained information from newspapers, formal invitations and tender boards for more than 61 per cent (140 projects) of the last three projects, 18.5 per cent (33 projects) from friends and relatives, while the remaining were from other sources (see table 7.13).

Table 7-13: Sources of information about construction projects

Source of information	First project n= 72 (%)	Second Project n= 72 (%)	Third project n= 72(%)	Overall n=216 (%)
Newspaper	20.8	18.1	25.0	21.3
Formal invitation	15.3	13.9	16.7	15.3
Tender board	25.0	27.8	22.2	25.0
Friends & relatives	16.7	20.8	18.1	18.5
Telephone & Fax	8.3	6.9	5.6	6.9
Radio &Television	2.8	5.6	1.4	3.2
Direct invitation	9.7	5.6	8.3	7.8
No answer	1.4	1.4	2.8	1.9
Total	100.0	100.0	100.0	100.0

When the respondents from consultancy firms were asked the same question, the responses revealed that information about 38.9 per cent (in 28 projects) of the last three projects was obtained by general invitations to all consultants, 25 per cent (in 18 projects) from direct invitations to the firm, in 18 per cent (13 projects) information was provided by friends and relatives, in 11.1 per cent (8 projects) it was obtained from tender boards, and in only 6.9 per cent (5 projects) information was obtained from newspapers.

The results showed that the most important sources of information were general invitations including in newspapers, by formal invitation and from tendering boards. In addition, most information was on paper or in verbal format. Furthermore, they indicate that tribal, family and friendship relationships are important sources of information. In other words, the results imply the presence of nepotism as a consequence of the influence of social and friendship relationships on the operations of the industry (see 3.5.2 and 6.4.1). In general, these results are supported by the findings in section 7.4.1.

The ANOVA test did not show any statistical variation at the 5% significance level in the information methods in the last three projects (the F ratio is 0.564 and the observed significance level is 0.570). It can be said that the information systems and channels currently used are mainly traditional. On the other hand the use of information technology in processing and accessing data and information was rare. This can be regarded as a weakness in the current information systems in the LCI. To improve information and

communication systems in the LCI, it is recommended in chapter nine that great effort should be made to use information technology in terms of channels, time and quality (see 2.8.1).

7.3.3 The Estimation Process

As argued in section 2.8.1, the estimating process is a crucial phase in the construction processes and operations of the CI. To explore this issue empirically in the LCI, the respondents from construction firms were asked a number of questions regarding the methods of estimating and techniques used for preparing the initial costs of and tenders for construction projects.

The empirical findings in table 7.14 show that 104 (48.2%) of initial cost estimates or bids of the last three projects (216 projects) were prepared by manual methods, 39 (18%) using computer-aided systems, and 57 (26.3) by both manual and computer systems (see table 7.14).

Table 7-14: Methods of preparing project estimates

Methods of preparing project estimates	First project n= 72 (%)	Second Project n= 72 (%)	Third project n= 72 (%)	Overall n= 216 (%)
Manual methods	54.2	45.8	44.4	48.20
Computer- aided systems	16.7	16.7	20.8	18.10
Both	22.2	27.8	29.2	26.30
Others	5.6	6.9	4.2	5.60
No answer	1.4	2.8	1.9	1.80
Total	100.0	100.0	100.0	100.0

The results indicate that, at the time of this study, there were three main techniques for preparing cost estimates of construction projects: manual methods, computer-aided systems and a combination of both. It is clear that manual methods were dominant. This may give an indication that using computing and software packages in preparing estimates of projects in Libya is in its infancy. This agrees with the results in section 6.5.4.

To identify the efficiency of contractors' estimates, the respondents from construction firms were asked whether their estimates met the actual costs of their last three projects. The responses showed that 53 per cent (114 projects) of the estimates of the last three projects were very close to the project's initial budget. However, 42.5 per cent (92 projects) were under-estimated and failed to meet the overall cost of projects. This may imply that a large proportion of project estimates suffered from deficiencies and lacked

accuracy. As found above, this is possibly because of the reliance on traditional preparation methods. This result agrees with the findings in section 7.1.3, which indicated that the final value of more than forty per cent of projects exceeded their original contract values. Furthermore, inaccurate estimates increase risk, as Wells (1985) suggested (see 2.8.1).

To address the general causes of the low degree of accuracy in estimates of a large number of construction projects at the time of this study, the semi-structured interviews conducted with decision makers, site managers and financiers revealed that the key causes underlying inaccurate estimates were, in general, lack of experience among estimators/surveyors, lack of efficient data and information about project elements, incomplete project documents, irregular supplies of workers and basic construction materials (cement and steel), administrative corruption, inflation and the unstable exchange rate of the LD against foreign currencies. Also, not enough time was given to preparing bids. Most of these causes were identified when respondents were asked about the main causes of changes in design and delays to construction projects (see 7.2.5 and 7.4.6). This gives an indication that inaccurate estimates are inevitable consequences of a lack of constructability and buildability in design documents and an unstable operating environment.

To sum up this section, most bids for construction projects were prepared by manual methods and did not fit the planned budgets of a large number of projects. Apparently, administrative, economic and technical reasons underly the low degree of accuracy of project estimates. Such circumstances affect the operations of the LCI in terms of delays to projects and cost overruns as well as increasing disputes between clients and contractors.

7.3.4 The Selection of Contractors

The literature suggests that one of crucial decisions in the construction process is the selection of the main contractors, as highlighted in section 2.8.1. Therefore, clients were asked to specify the key factors they considered when selecting contractors for their last three projects. The results are summarized in table 7.15. It is clear that, as in most countries, the selection of a contractor in the LCI is commonly based on competitive bidding, the value of the contractor's tender, the resources of the firm, the duration of the project and the contractor's reputation (see table 7.15). The pre-qualification process is usually managed and controlled according to decision No. 8 of 2004 concerning the

tendering and contracting procedures by technical, financial and legal tendering committees (see 4.4.1). These results agree with the findings in sections 7.2.4 and 7.3.4.

Table 7-15: Methods of selection of contractors

Methods of preparing project estimates	First project n= 12 (%)	Second Project n= 12 (%)	Third project n= 12 (%)	Overall n= 36 (%)
Combination of factors	33.3	41.7	33.3	36.1
The Lowest tender	33.3	25.0	41.7	33.3
Firms resources	8.3	16.7	16.7	13.9
Time to complete the project	16.7	0.0	8.3	8.3
Contractors' reputation	8.3	9.6	7.1	8.3
Friends recommendations	0.0	0.0	0.0	0.0
Total	100.0	100.0	100.0	100.0

This confirmed that traditional procurement systems (see 2.8.2) are dominant in the LCI, which may be attributed to the current contractual agreements (decision No. 8 of 2004) which do not include other contractual methods such as design-build or design, build, and operate/transfer. Added to this, the government is a major client of projects, and key actors and professionals lack experience in other procurement systems. A review of a random sample of projects signed in 2002 in Tripoli Shabia (municipality) showed that the majority were contracted according to the standard form (see 4.4.2). According to this form, the construction process is usually divided into design, construction and supervision phases.

The literature on construction procurement systems (see 2.6.2) indicates that the key feature of the traditional procurement system is the fragmentation of construction processes into design and construction phases. Furthermore, Ngowi (1998, p.343) pointed out that the traditional procurement method is associated with the following characteristics: fragmentation of the industry; inefficient co-ordination between parties and suppliers; and modifications during the whole project life cycle. Thus, it can be said that most of the obstacles constraining the operations of the CI in Libya can, in general, be attributed to the wide use of traditional procurement systems (see 7.4.5, 8.2, and 8.3). Furthermore, this system is probably affected by administrative corruption, social pressure and nepotism, which are key features of the CI's operating environment in Libya (Al–Abbar, 1999, p.2).

Thus, it is reasonable to conclude that there are a number of shortcomings and deficiencies in the current construction procurement systems in the LCI. Recommendations to improve procurement systems are given in chapter nine.

7.3.5 The Nationality of Contractors

As discussed in chapters three and four, foreign firms have been an important part of the LCI. To explore this issue empirically, the clients were asked to cite the nationalities of the firms which constructed their last three projects. The results in table 7.16 confirm that, at the time of the survey, nearly fifty-six per cent of the projects were constructed by local domestic partnership and public construction firms. This agrees with the results in sections 6.4.1, 6.4.3 and 6.4.4 and the discussion in chapter four which indicated that at the present time the construction market is dominated by local domestic partnership firms. However, it should be noted that the number of foreign companies operating in the Libyan construction market has declined over the past decade.

Table 7-16: Nationality of construction firms

Nationality of construction firms	First project n= 12 (%)	Second Project n= 12 (%)	Third project n= 12 (%)	Overall n= 36 (%)
Domestic partnership/Libyan	33.3	33.3	25.0	30.6
Public/Libyan	16.7	25.0	33.3	25.0
Joint venture	8.3	0.0	8.3	5.6
Foreign	16.7	8.3	16.7	13.9
Built-owners (individuals)	25.0	8.3	0.0	11.1
No-answer	0.00	25.0	16.7	13.9
Total	100.0	100.0	100.0	100.0

This can be attributed to the increase in the number of local consultancy and construction firms (see 6.4.1 and 6.4.2); the general withdrawal of foreign firms from the Libyan construction market during the sanctions period (see chapters three and four); and the state's policies to restrict the operations of foreign companies and to encourage local firms, as discussed in chapter four (see chapter three and four).

However, the empirical findings in sections 7.2.3 confirmed that large construction projects are still performed by foreign firms. A review of the contracts of construction projects in 2003 showed that foreign companies were still widely involved in the construction market, particularly in large civil engineering projects (GCP, 2003). This is attributed to the low capability of local firms (General Peoples Committee for Services Affairs, 2002, p.13). Also, the findings in section 8.4 show that, according to the current capacity and capability of the LCI, there is still a need for foreign construction workers and firms. Added to this, according to Law No. 5 of 2004 concerning foreign investment in construction in Libya (Government of Libya, 2004), the number of foreign companies is

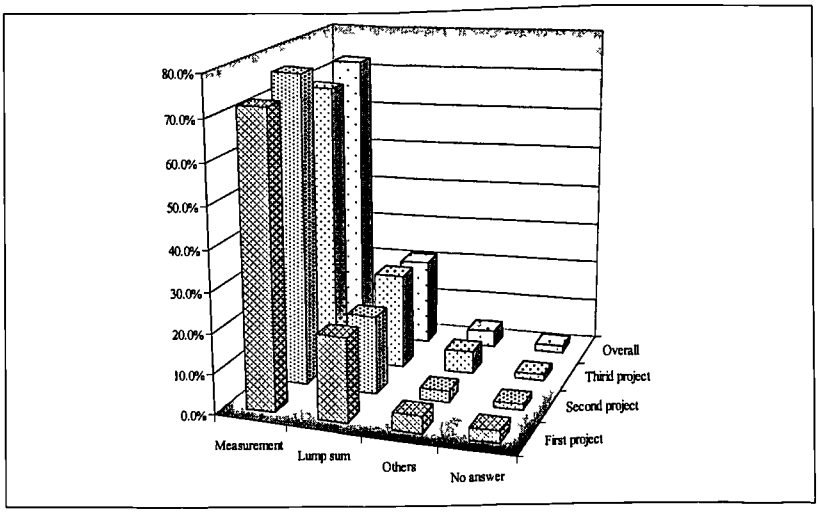
expected to increase in future years, and most of their operations will concern large and complicated infrastructure works and those in the oil sector.

Thus, it is clear that foreign firms still have a key role to play in the LCI and it will take a long tim to free the LCI from their influence in construction operations. It is argued that foreign firms are one of the key factors which have affected (and are affecting) the current operations of the LCI in terms of structure, capacity and capability.

7.3.6 Contracting Methods

To explore the contracting methods and types of contracts used in the LCI, the respondents from construction firms were asked a set of questions about contracts and their key deficiencies.

Figure 7-1: Breakdown of the types of construction contracts



As can be seen in figure 7.1, nearly seventy-three per cent (157 projects) of the last three projects performed by the respondents' firms were managed by measurement contracts, while of the rest 21.3 per cent (46 projects) were managed by lump sum contracts, and only 4.1 per cent (9 projects) were controlled by a combination of contractual agreements. No answers were provided about the remaining 1.9 per cent (4 projects). From previous the results of preceding in sections 6.4.3, 6.4.4 and 7.2.5, it was no surprise that measurement contracts, which are based on bills of quantities, were the most common type of contractual agreements between clients and contractors. This agrees with the results in section 7.3.4, and confirms that the traditional contract structure was the most popular in the LCI at the time of this study.

In an initial attempt to identify why the above methods are the dominant contracting system in the LCI, the key decision makers, researchers and academics were asked in semi-structured interviews about this phenomenon. The replies showed that the most important reasons are as follows. Firstly, the government is a major client of projects, and is not particularly concerned about introducing new delivery systems for construction projects. Secondly, knowledge is lacking regarding the advantages and disadvantages of current contracting methods, possibly because of a shortage of relevant studies and; thirdly, clients, decision makers, managers and professionals lack experience in other procurement methods. Added to this, it is believed that the way by which the CI is understood in Libya is another important reason. For example, it has been observed that current architectural and engineering educational systems in Libya see construction as a set of separate processes (see 8.1).

To identify the quality and efficiency of contracts, the respondents from construction firms were asked whether they experienced any problems with the contract documents of their last three projects. About 48.6 per cent (35) of the respondents had experienced problems, while 51.4 per cent (37) had not. This indicates that a large number of contractors complained about deficiencies in contract documents. In an effort to identify specific deficiencies in contract documents, the site managers interviewed were asked about the most common problems they experienced in construction contracts. Their replies showed that the most common difficulties were incomplete contract documents, mistakes in drawings and bills of quantities, unrealistic terms and conditions, and unclear specifications. These results support those in sections 7.3.3 and 7.4.6. Furthermore, they again raise the issue of the buildability of design documents (see 2.8.1, 7.2.5).

To test the above results statistically, the ANOVA test did not show any statistical variation at the 5% significance level between the contracts of the last three projects of construction firms (the F ratio is 0.011 and the observed significance level is 0.989).

To sum up the findings in this section, at the time of the study, the vast majority of projects were organized in traditional or sequential contracting systems. Several factors underlying deficiencies in contract documents have been identified. These factors have affected the operations of the LCI in terms of contractual relationships, payment systems,

and delays in payments and to projects. Consequently, a set of recommendations to improve construction processes and contract documents are suggested in chapter nine.

7.4 Production Phases

This section empirically explores the production processes and its key aspects. The respondents from consultancy and construction firms were asked a number of questions focused on communication methods and channels, construction materials, labour, informal workers, construction duration and delays to projects

7.4.1 Communication Processes

To explore these issues of communication in the LCI, the respondents from construction firms were asked about the methods of communication they used during operating their last three projects.

The responses are shown in Table 7.17. The respondents indicated that they used several methods to communicate with other participants during construction and production processes. However, letters, face to face and a combination of methods (81%) are the most dominant channels (see table 7.17). These results are supported by the findings in section 7.3.2. However, such methods are slow, subject to delay and affected by the social and cultural context, particularly in Libya's context in which tribal and cultural factors remain robust (see 2.6.1 and 3.5.2).

Table 7-17: Communication methods

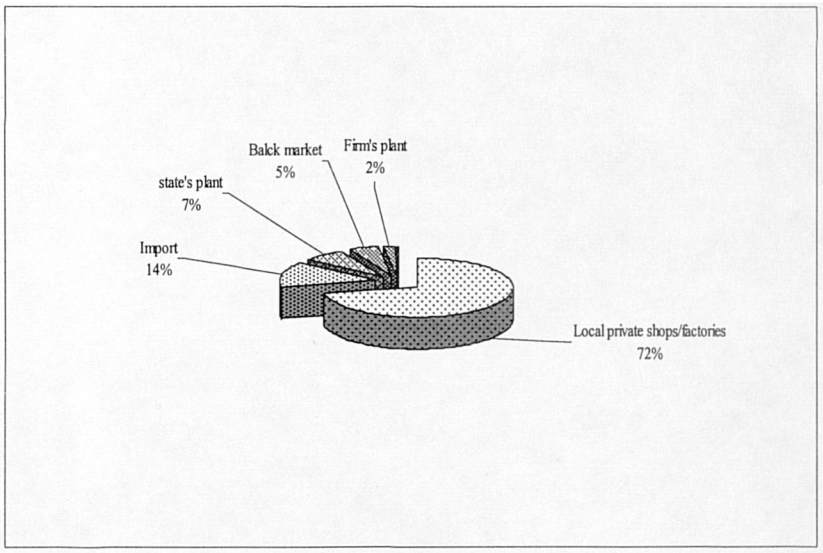
Communication methods	First project n= 72 (%)	Second Project n= 72 (%)	Third project n= 72 (%)	Overall n= 216 (%)
Letters	43.1	37.5	27.8	36.1
Face to face	26.9	23.6	23.6	24.5
Combination of methods	13.9	18.1	29.2	20.4
Telephone & fax	11.5	13.9	14.9	13.4
E-email	1.7	2.8	3.9	2.8
No answer	1.4	4.2	2.8	2.8
	100.00	100.00	100.00	100.00

Thus, it is clear that, modern information technologies such as e-mail, digital, visual and internet-related services were not widely used. It is also clear that the current communication systems in the LCI are based on paper and verbal methods. This is seen as a weakness in the industry. Therefore, the current communication and information systems in the LCI must be judged inadequate (see 2.8.1). In this context, a set of key conclusions and recommendations is provided in chapter nine.

7.4.2 Construction Materials

To explore the issue of construction materials in the LCI, a visual survey was conducted in Tripoli city; its main objective was to photograph, document and identify the operations of the CI and its associated construction resources (see chapter five and appendix E). Furthermore, the respondents from construction firms were asked about the sources of thirteen types of construction materials and components. The purpose was, on the one hand, to understand the access of the firms to construction materials, and on the other hand to identify the general trends of supply in construction materials, as well as to address the impacts of these materials on the characteristics and operations of the CI in Libya. In general, the empirical findings revealed that nearly 72 per cent of the thirteen construction materials were obtained from local private shops and small private manufacturers (see figure 7.2).

Figure 7-2: Channels of supply of construction materials



Thus, local private shops and small domestic firms were the major suppliers of construction materials in Tripoli city at the time of study. It may be observed that a similar situation exists across the entire country.

From previous experience of working in Libya, together with the visual survey, a range of observations during the empirical study and findings from the interviews as well as the empirical findings in section 6.5.3, it is evident that Portland cement, steel reinforcement, sand, aggregates and water are the five most important key construction materials in Libya's construction market. This observation is supported by the discussion

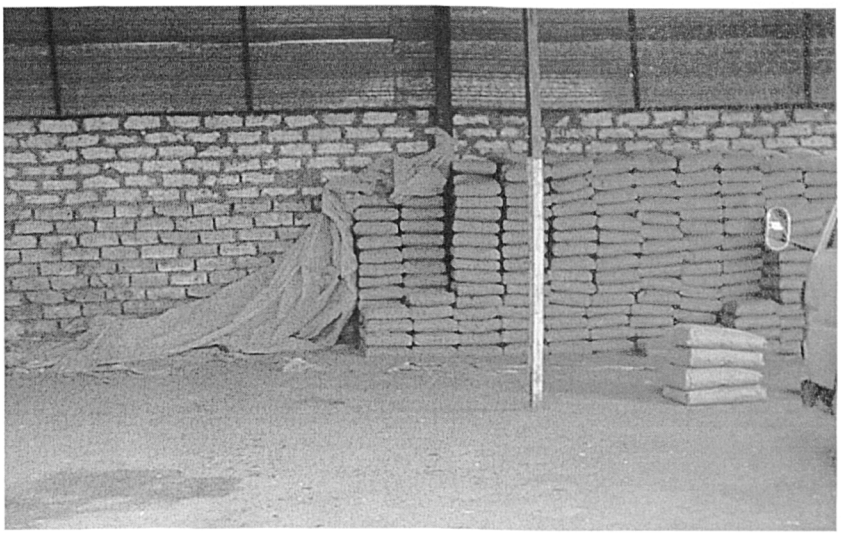
in sections 4.6.3 and 6.5.3 which indicates that construction in Libya is based on cement and its associated products. In the words of one of the interviewed academics, "in Libya, we are living and working in dry bags of cement, the frames, roofs and walls of our buildings comprise reinforced concrete and cement bricks, and the plastering and finishing of internal and external walls are done with cement". Among the 72 respondents from construction firms, 20 (40.3%) obtained Portland cement from the state's cement plants, 13 (18.1%) imported it, 16 (22.2%) gained it from the black market and 14 (19.4%) from private local shops.

Based on the above, together with the discussion in chapter four, comments compiled from interviews with the producers and suppliers of construction materials, and observation, it is evident that at the time of the study cement and steel are still monopolized by the state in terms of production and distribution. Furthermore, shortages and irregular supplies of cement and steel are considered as one of the key features of the Libyan construction market, owing, in part, to low levels of production, the type and timing of demand, administrative restrictions and corruption (see 4.6.4 and figure 4.13). This causes the disruption of work on construction sites and delays to construction projects (see 2.7.1). Owing to the shortage and fluctuating prices of cement, Libya imported large amounts of cement in 2005 (Arabic News, 2005). However, cement and concrete industry is popular in both urban and rural areas in Libya (see appendix E).

Thus, it is reasonable to suggest that the current operations of the LCI are generally based on cement and labour-intensive methods, and a majority of its operations use on-site assembly (see appendix E). Given distances between settlements, prefabricated construction systems are likely to be expensive in terms of transportation. However, this system enables the LCI to avoid the negative impacts of the weather (high temperatures) on concrete production during summer.

Furthermore, it was observed that significant proportions of cement and steel were supplied by indirect channels in the black market. In addition, owing to the country's large area (see chapter three and 6.4.4), the transportation of construction materials is to be likely expensive (see 8.1.1). These points are supported by the discussion in chapter four and the findings of several government reports (GPCPBC, 1998; RCBM, 1999, 2000, 2001, 2002; GCH, 1995, 2000).

Figure 7-3: Distribution of cement through informal channels



Source Author (2003), Tripoli.

Furthermore, one of the more interesting findings concerns the issue of water (see chapter three). Throughout the theoretical and empirical studies in this research it was observed that in the context of arid and semi-arid regions such as in Libya the relationship between construction activities and protecting the fragile environment should be a central concern (see chapter three).

Figure 7-4: Press-stressed concrete beams

Source: Author (2004), local shops for selling press-stressed concrete beams, Sauk-Aljuma.

For example, at the time of the study, it was observed that heavy trucks were used to supply water in tanks to construction sites in Tripoli city. This phenomenon exists across Libya. In addition, the cost of a tank of water is between LD 100 and 150, which is considered expensive.

Figure 7-5: Supply of water for construction purposes

Source Author (2003), Tarik-Aehdash Yunio, Tripoli.

This indicates that water is an important issue in construction where production and operations are based on cement and concrete, particularly, in arid and semi-arid lands (see chapters three and four). A manager of one the five construction projects which was visited during the empirical study was asked about this issue. He said that: "the problem of water is serious in Libya in general, but in construction it has indirect effects. For example, the quality of water is not suitable for concrete works in this site in particular and in Tripoli city in general because the majority of water sources are salty. As a consequence, water is treated before being used in concrete". It is evident that in such circumstances water should be considered as an important construction resource in the same way as are labour, money, materials, etc.

Given the geographical circumstances of Libya (see chapter three), it can be argued that the use of water in the current operations of the LCI in terms of quantity, quality and management is of significance owing, in part, to the fact that Libya is a country which suffers from acute shortages in water supplies in terms of quantity and quality. Again, it is argued here that this issue should be considered for Libya in particular and in arid and

semi-arid countries in general. Furthermore, the position and proportion of water in the operations of the LCI in terms of embodied water and management in Libya and other arid and semi-arid countries should be investigated in specific future research.

Figure 7-6: Concrete buildings

Source Author (2003), Taric Al-Mataar housing project, the Internal Investment Company.

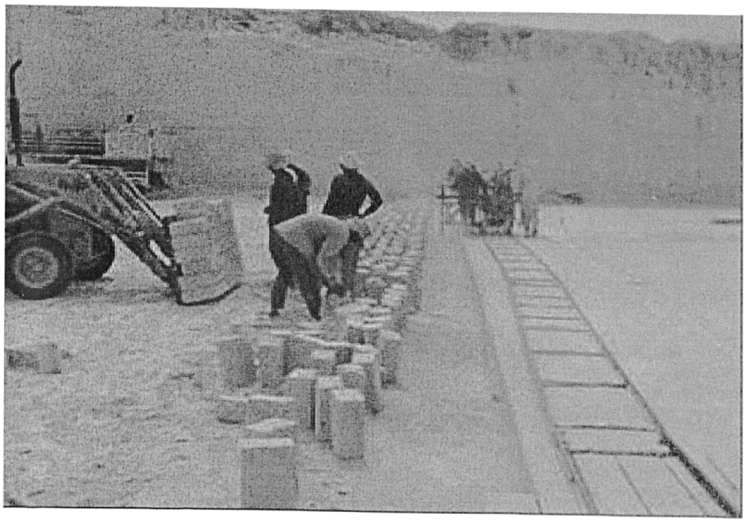
The visual survey and a set of observations have confirmed that the second most important material used in the LCI is steel. 35 (48.6%) of the firms obtained this material from state-owned plants[24], while 37 (51.4%) bought it from the black market. These data show that the state is the key producer and supplier of steel. However, it was observed that there were shortages or irregular supplies of steel in the construction market at the time of the survey. More than half of the respondents from construction firms relied on black market channels for obtaining steel. This is supported by previous government reports, such as the report of the GPCPBC (1998, p. 22), which indicated that shortages in cement and steel are a concern in the LCI. Also, the respondents indicated that private shops and local distribution centres met their demands for sand and aggregates.

The visual survey, empirical findings and observation confirmed that limestone and cement brick are dominant walling construction materials (see figure 7-7). Nearly 93 per cent (67) of firms obtained natural stone block from local private distribution centres

[24].The Libyan Iron and Steel Company has a huge iron and steel mill in Misurata, around 210 kilometres east of Tripoli city, which produces iron and steel bars and angles for structural purposes.

and quarries in the city of Tripoli and its vicinity, while the other 6.9 per cent (5) produced blocks in their own quarries. This gives an indication that private stone quarries play an important role in supplying this material (see figure 7.7 and appendix E).

Figure 7-7: Production of natural stone block



Source Author (2003), natural stone quarries, Tripoli.

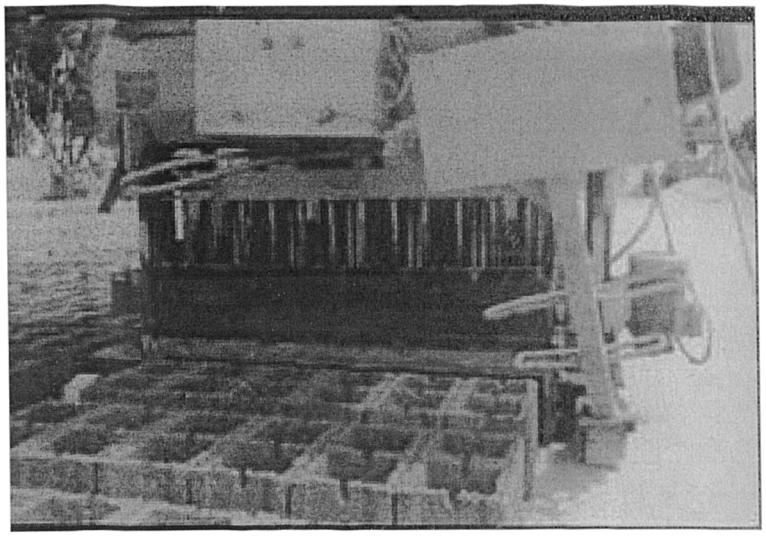
Furthermore, 13 (18.1%) of the construction firms purchased clay bricks from state-owned factories (public companies) while, of the rest, 51 firms (70.8%) bought from local private shops, and 7 (9.7%) imported it directly from international markets. Thus, private and local shops were the main suppliers of this material. It was observed that clay bricks were imported from Egypt or Tunisia (see figure 7.8 and appendix E).

Figure 7-8: Imported clay bricks

Source: Author (2004), Tarik-Aehdash Yunio, Tripoli.

Moreover, the visual survey, observations and the empirical findings confirmed that cement bricks are a key walling construction material. Nearly eighty-nine per cent (64) of firms obtained cement bricks from small private plants and distribution centres (local suppliers), whereas 9.7 per cent produced bricks in their own plants. At the time of the study, private small manufacturers, local shops and distribution centres played an important role in supplying cement bricks (see figure 7.10 and appendix E).

Figure 7-9: Producing cement bricks in local private factories



Source: Author (2003), Tajura city, Tripoli.

Several researchers have indicated that, owing to acute shortages of natural stone blocks in the construction market over the past decade, demand for cement bricks has increased rapidly (Ahtiwsh et al. (2004, p. 145); Abo-Srioial et al. (2004, p.151-152). This was supported by the current author's observations when visiting five construction projects in this study. The vast majority of the walls of buildings were constructed with hollow cement bricks (see 5.7.3). Thus, demand for cement bricks will increase in the coming years. This will put more pressure on the cement industry in the country and widen the current gap between the supply and demand of cement (see figures 4.12 and 4.13 in chapter four).

As mentioned in sections 5.7.2 and 5.7. 3, some cases of natural stone quarries and manufacturers producing construction materials, clay bricks, cement blocks and other materials were visited during the empirical study. In addition, informal interviews were conducted with managers. The outcomes of these visits were combined with the above

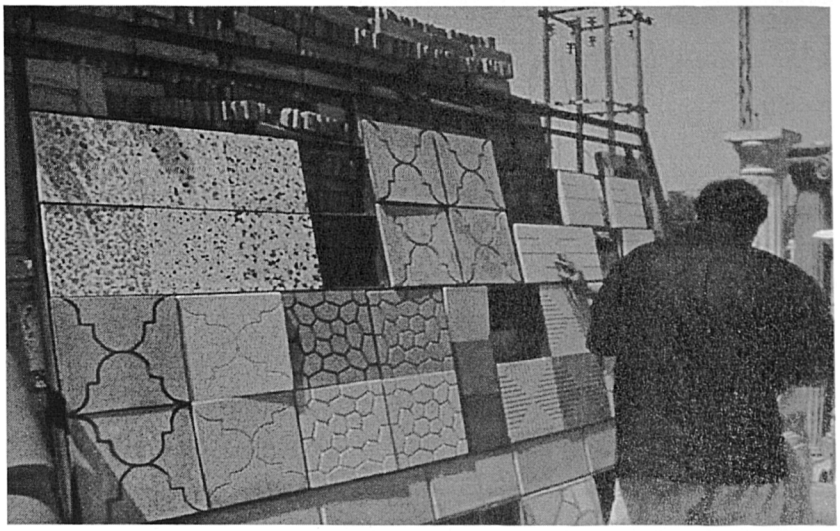
findings (see appendix E). This enables the conclusion to be made that natural stone block and cement and clay bricks are the three dominant structural materials for walls in the Tripoli region in particular and in Libya in general. These materials require a large number of workers in terms of processing, production, transportation and construction. Consequently, it is argued that the operations of the industry are generally based on labour-intensive techniques and high levels of embodied water (see 2.7.3 and 6.5.3).

Furthermore, 82 per cent (59) of firms indicated that they obtained windows and doors from local private workshops, 9.7 per cent (7 firms) produced these materials in their own workshops, and 6.9% (5) indicated that they imported these materials from international markets. Only one firm (1.4%) obtained them from public manufacturers. Furthermore, 72.2 per cent of construction firms purchased floor tiles from small manufacturers and local private shops, while 16.7 per cent imported them from international markets (public or foreign companies). Nearly seven per cent (7 firms) pointed out that they produced tiles in their own plants, and 4.2 per cent (one firm) bought them from other construction firms. The above results confirm that local private workshops were the main suppliers of these materials at the time of the study.

However, the findings of the visual survey, observation and the findings of the survey confirmed that the majority of ceramic tiles and electrical and sanitary fittings are imported from international markets. 66.7 per cent (48) of the firms pointed out that they imported ceramic tiles from various countries, while 31.9 per cent (23) brought these from local private shops which had also imported these materials (see figure 7.10 and appendix E). Based on experience and a range of observations during the empirical study, it is evident that the overwhelming majority of electrical materials and fittings were imported because Libya lacks an efficient manufacturing industry in these types of components.

Among the 72 firms, 34.7 per cent (25) directly imported sanitary fittings (toilets, baths, sink taps, etc.) from international markets, while 61.1 per cent (44) purchased them from local private shops which had imported them, and the other 2.8 per cent (2) obtained them from state-owned plants. It is clear that the majority of sanitary fittings were imported.

Figure 7-10: Tiles types



Source: Author (2004), local shops for tiles, Tarik-Aehdash Yunio.

Furthermore, 41.7 per cent (30) of the firms indicated that they imported electrical materials and fittings from international markets, 56.9 per cent (41) purchased them from local private shops which had imported them, and 1.4 per cent (one firm) obtained them from state-owned manufacturers (see figure 7.11 and appendix F).

Figure 7-11: Private shops for electrical materials and fittings

Source: Author (2004), local shops for selling electrical materials, Suq -Atulata in Tripoli.

Furthermore, the visual survey and the findings show that 62.5 per cent (45) of firms purchased coating and painting materials from local shops, 26.4 per cent (19) obtained them from local small manufacturers, and 11.1 per cent (8) imported them from international markets. From the past experience of the current researcher working in the

RCBC, it is estimated that more than a half of national demand for coating and painting construction materials were imported from countries such as Tunisia, Italy and Morocco.

Figure 7-12: Local shops for fitting and finishing materials

Source: Author (2004), Suq -Atulata in Tripoli.

All in all, this section confirmed that significant proportions of construction materials are produced locally. However, the national capacity to produce cement and steel fails to meet the demand of the construction market, and the majority of sanitary and electrical materials were imported. Also, the findings revealed that the operations of the LCI are based on five important basic construction materials. These are cement, steel, sand, aggregates and water. Owing to the nature of these materials, it is argued that the operations of the LCI are characterized by labour-intensive methods.

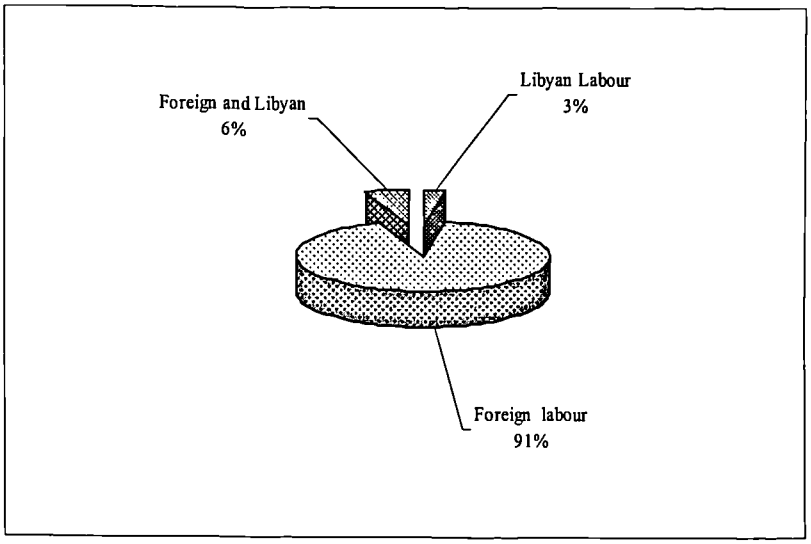
Thus, it can be said that there are weaknesses in the planning, production and supply of construction materials and components. The complete reliance of the LCI on cement and concrete as dominant construction materials has affected (and is affecting) its operations in terms of productivity, capacity, delays to and duration of projects as well as the nature of the final physical products. Recommendations to improve construction resources are suggested in chapter nine.

7.4.3 Labour

The respondents from construction and consultancy firms were asked to answer three questions relevant to their labour forces. The responses were used as a measure of the size of firms and the general characteristics of construction workers in the LCI.

Figure 7.13 shows that 91.7 per cent (66 firms) of the construction firms employed foreign workers in their last three construction projects, 5.6 per cent (4 firms) depended on both Libyans and foreign workers, while only 2.8 per cent (2 firms) indicated that they relied on Libyan workers alone. These results are supported by the discussions in chapters three and four, which indicated that, owing to Libya's limited resources, foreign workers are a key factor in the Libyan economy. The findings of several researchers, such as Ibrahim (1987); Kim (1988, p. 225); Wells (1996, p.297) and Oz (2001, p.137), also indicated that foreign construction workers and firms had intensively migrated to Arabic oil-rich countries in the Middle East and North Africa, particularly in the 1970s and 1980s (see chapter four). Therefore, it could be confirmed that the vast majority of the operational workers in the LCI are not Libyans. This may lead to the suggestion that operational construction is seen as an undesirable occupation in Libyan society.

Figure 7-13: Nationality of construction workers



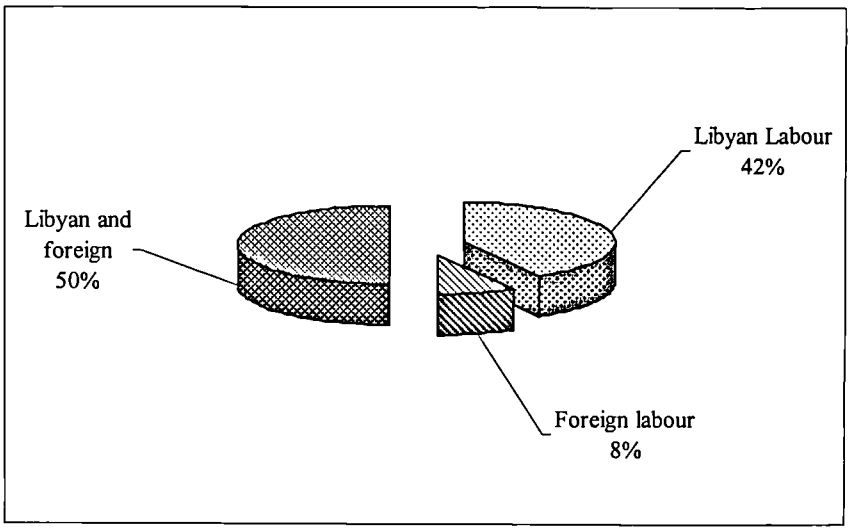
To address this issue, the decision makers, site managers and researchers interviewed were asked why construction work was unattractive to Libyans. Analysis of the responses showed that there is a consensus about three main causes: the country's limited resources, lack of skilled and craft workers and social and cultural circumstances.

Respondents from 49 (68%) construction firms indicated that they employed casual workers, 18 (25%) employed both casual and permanent workers, and only 5 (6.9%) relied upon permanent workers to operate their last three projects. The results indicate that most workers were employed on a casual and temporary basis (see figure 7.15). This suggests

that informal workers are important in construction, as addressed in chapter four. In the light of the comments of respondents, the size of the workforce in terms of numbers and structure varies from one project to another and from one phase to another.

On the other hand, when the respondents from consultancy firms were asked about the nationality of the professional staff they employed, ten (42%) of the firms employed Libyan professional staff, 12 (50 %) relied on both Libyans and foreigners, and only 2 (8.3%) depended on foreigners.

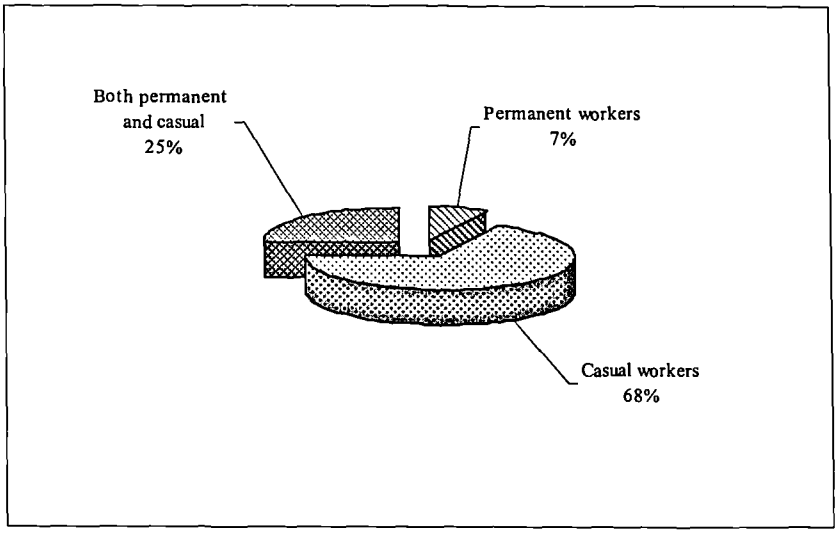
Figure 7-14: Nationality of workers in consultancy firms



However, when the respondents were asked about employment patterns, the results show that most of the consultants were employed part-time. This can be attributed, in general, to the nature of work in the consulting sector in which projects are based on design and technical issues. In addition, most consultants were Libyans; this can be understood as a consequence of the Libyan employment laws which allow consultants to work in the evening.

At the time of the study the operations of construction relied heavily on foreign workers. In addition, the employment system is based on casual workers. This means that self-employed and informal construction workers are an important source of construction labour in the LCI. This confirms that the informal construction sector affects the current operation of the LCI in terms of production, supply of construction resources and labour and the size, structure and shape of the industry.

Figure 7-15 : System of employment of construction workers



In short, labour is one of the biggest issues in and key challenges of the LCI (see chapters three and four). This phenomenon exists in many developing countries, such as Saudi Arabia, Kuwait and Singapore (see 2.2 and 2.7.3). Ofori (1991, p22) argued that in many developing countries the CI is similarly unable to attract workers. Thus, it can be said that the operations of the LCI are affected by foreign workers in terms of supply, skills, productivity and culture.

7.4.4 Informal Workers

Despite the fact that the informal construction sector is beyond the main scope of this study, the visual survey, the discussion in chapters three and four and the findings of the survey (see 7.4.3) showed that the informal construction sector plays a key role in the operations of the LCI, as in most developing countries (see chapter two). In addition, this conclusion is confirmed by a range of observations throughout the different stages of the empirical study. It has been noted that in every city and town in Libya there were particular places where informal construction workers gathered and could be found. For instance, in Tripoli city, pick-up points for informal construction workers were a common feature at the crossings of main streets and public squares. Souk-Altulta, Al-Fernage, Taric- Ahadsh Uniuo and Al-Hadba Alkadra were the most significant pick-up points for informal construction workers at the time of the study (figure 7.16 and appendix E). This phenomenon also exists in many developing countries (see 2.3.4). These sites were visited during the study, and a number of informal interviews were conducted with workers. Most indicated that they were satisfied with this flexible type of employment system.

Following from the above, during the author's visits for this study to five projects under construction (see 5.7.3), it was observed that a large number of construction firms employed informal workers. In addition, many informal firms were involved in subcontracting activities, such as supplying labour and materials for formal firms. The majority of foreign construction workers are from Arab countries such as Egypt, Tunisia, Syria, Sudan and Morocco. In addition, a large number of workers were from African countries such as Ghana and Nigeria. This can be attributed to various geographical, political and cultural circumstances. A report regarding the illegal immigration of workers (informal workers) to Libya broadcast by the Arabic television channel Aljazeera in 2004 indicated that the vast majority of those informal workers were from Arabic and African countries (Al-Badrey, 2004). Also, Zahlan (1984, p. 214) indicated that in most Arabic countries workers in construction are employed on a daily and casual basis.

Figure 7-16: Pick-up point for informal construction workers in Souk-Altulta in Tripoli city

Source: Author (2004), Suq -Atulata. in Tripoli.

Moreover, it was also observed that operations in the five sites visited often did not comply with safety conditions and regulations. Workers and engineers often did not use safety clothes and tools. This implies that there is little consciousness of the issue of safety in the LCI. This may be attributed to a lack of knowledge and a poor safety culture.

Generally, it was observed that, the informal sector comprises self-employed workers and informal small firms which are involved in informal construction activities, subcontracting to formal contractors, and supplying construction materials, labour and other services. These features exist in informal construction sectors in most developing countries. For example, Mlinga and Wells et al (2003, p.278) found that in Tanzania informal firms subtracted and supplied labour for the formal sector.

One key decision maker in the General Secretariat of Planning indicated that a majority of construction activities, especially in the building industry, could be classified as illegal (i.e informal). He said that unregistered construction firms and illegal foreign workers[25] carried out a significant proportion of works in the manufacturing and construction sectors. He added that, in Tripoli city for example, many illegal neighbourhoods had been constructed by illegal firms and workers over the past decade on the outskirts of the city, such as Al-Njela, Taric-Al-Matar and Slah-Edaeen. This reinforces the argument that informal construction is an important part of the CI in Libya. Furthermore, when decision makers and site managers were asked about the key reasons underlying the expansion of the activities of the informal construction sector over the past two decades, their replies revealed that most clients cannot comply with current building regulations and standards and the costs of the formal sector. Reasons include the state's policies in the construction sector, particularly in the 1980s (see chapter three); the state's policies of opening the country's boundaries to Arabic and African workers without their obtaining visas; for political reasons; inflexible building and construction permits, specifications and standards; the wide reliance of the construction market on foreign construction workers; and the lack of land with basic facilities for construction purposes. Furthermore, social structure, tribalism and nepotism in Libya are, in part, a suitable social and economic context for the informal construction sector.

As in most developing countries, this sector has grown rapidly over the past two decades owing to the inability of the formal sector to meet national demand in terms of quantity, high standards and the cost of formal construction, and the tribal structure of the LCI (see chapter two). In short, despite the planning literature in Libya intending to organize the LCI according to the standards of the formal construction industry, informality, is one of the key features of the operations of the LCI where construction

[25] This term is widely used in the economics and planning literature to describe informal foreign workers who work in the Libyan market without formal contracts.

work is carried out by informal workers without much consideration given to construction regulations. There is view which argues that one of the deficiencies of the LCI is its complete reliance on foreign and informal workers. However, the current author argues that given the shortage of skilled and semi-skilled workers in the Libyan construction market, foreign workers make a considerable contribution to the country's economy and the operations of the CI. Therefore, one of the key findings of this study is that the informal sector has a vital role in supplying labour, materials and construction production in LCI and this.will grow in the coming years owing, in part, to the low capability and efficiency of the formal construction industry

7.4.5 Construction Duration

To identify the average length of construction contracts or the average length of project life cycles (for construction only) in the LCI, the respondents from construction firms were asked to specify the length of the contracts in their last three projects. Table 7.18 shows that 41.7 per cent (90 projects) of the projects had a duration ranging between 12 and 18 months, 23.9 per cent (71 projects) less than 12 months, and 16.1 per cent (36 projects) between 19 and 24 months. In short, the duration of construction for most of the projects (74.6%) was less than eighteen months, since the majority of projects were small in terms of value and scale (see 7.1.3).

Table 7-18: Duration of construction contracts

Duration of contracts(months)	First project n=72 (%)	Second Project n=72 (%)	Third project n=72 (%)	Overall n=216(%)
0-6	7.1	8.6	12	9.3
7.12	29	30.3	11.6	23.6
13-18	38.9	41.7	44.4	41.7
19-24	15.3	12.5	22.2	16.3
More that 24	6.9	2.8	6.9	5.6
No answer	2.8	4.2	2.8	3.5
Total	100.0	100.0	100.0	100.0

However, it should be noted that decision makers complained about the long duration of construction projects in Libya. This was supported by comments from clients. Analysis of the replies of site managers and decision makers show that the low productivity of construction firms and subcontractors, the lack of skilled workers and site managers, the unstable operating environment and delays in payments were considered as the most important causes underlying the long duration of projects in the LCI at the time of this study. Thus, it can be said that one of the features of the operation of the LCI is its

long construction duration. This can be attributed to the current procurement systems, construction and project management and the nature of construction technology.

7.4.6 Delays to Projects

When the respondents from construction firms were asked whether or not their last three projects were completed within their contractual durations, only 51.4 per cent (111 projects) of the projects were completed without any delay, while of the rest 45.4 per cent per cent (98 projects) were delayed and no answers were provided about 3.2 per cent (7 projects).

These results give a strong impression that significant proportions of projects were delayed. This is supported by the findings in sections 8.2 and 8.3. Furthermore, when the respondents from consultancy firms were asked the same question, 62.5 per cent (46 projects) of projects were completed during their contractual durations, while 37.5 per cent (26 projects) were delayed. Clients agreed with the contractors and consultants, saying that 38.9 per cent (14 projects) of their last three construction projects were handed over within the contractual duration, while 50 per cent were delayed. No answers were provided about four projects. These findings prove that delays to projects are characteristic of the CI in Libya. This result is supported by the reports of the GCP (2000, 2001, 2002 and 2003). For instance, of 11938 projects in *2003, 5013* projects *(42%) were delayed, suspended or* stopped owing to administrative and financial obstacles (GCP, 2003, p. 31). This indicates that a large number of projects were delayed and that the problem is very serious

Therefore, delays to construction project are common in the LCI, as in most developing countries. Several studies have been conducted for the purpose of identifying major factors causing project delays and cost overruns such as those by Halpin et al. (1992, p. 69), Chan et al., 1996, p. 569-570, Mezher et al. (1998), Assaf et al. (1995, 2006), Aimi et al. (1999) Odeh et al (2002), Frimpong et al. (2003), and Aibinu et al. (2002). These studies argued that delays to construction projects are one of the most common and costly problems in today's national and international construction industry, and that delays to projects have tremendous impacts on society and the economy as well as increasing project duration, disputes, claims and cost and time overruns (see 2.8.4).

Site managers, researchers and decision makers were asked in interviews about the key causes of delays to construction projects in the LCI. In general, the causes are the same

as in previous studies in other countries. From these interviews, the most important causes of delays to projects in the LCI are the lack of craft workers and site managers, the poor performance of contractors and subcontractors, delays in payments to contractors and suppliers, shortages and irregular supplies of construction materials (particularly of cement and steel), the lack of efficient subcontractors and the poor management of construction firms.

Thus, it can be argued that the absence or inefficient implementation of planning and project management are responsible for causing delays to construction projects and in payments to contractors in the LCI. For example Abbasi et al. (2002) investigated project management (PM) in developing countries, using Jordan as a case study. They pointed out that, owing to social, cultural, political and financial problems, the application of the tools and techniques of project management were only at the first stages of their development. Furthermore, the implementation of project management tools and techniques in Arabic countries would affect the overall economy.

From the above, it can be said that delays to construction projects are a common feature in the LCI. These damage reputations and the image of the LCI and cause a negative impact on society and the economy. Thus, there are clearly many weaknesses in construction planning and project management in the LCI. Close attention should be given to the root causes and to eliminating their impacts. Key conclusions and recommendations regarding this issue are suggested in chapter nine.

7.4.7 Summary and conclusion

As mentioned in the introduction to this chapter, its main aim is to identify the general characteristics of construction projects and to explore how they are initiated, funded, designed, procured and delivered, as well as reporting on the major obstacles hindering project progress. Thus, the key factors related to project and its associated processes and operations and their impacts on the operation of the LCI are addressed.

The empirical findings confirmed that the state is the major client of formal consulting and construction projects. In turn, the private sector has a relatively marginal role owing, in general, to the dominant role of the state in social and economic life and previous political and economic policies. This is regard as a weakness in the LCI in terms of the ownership and finance of construction. In addition, the findings show that, as

elsewhere, residential and non-residential buildings, infrastructure works, maintenance and repair works and other specific projects such as modernization, demolition and alterations are the main types of projects. However, the results showed that the vast majority of projects are buildings and infrastructure, and intensive demand for new construction is likely to be placed upon the CI in Libya in the near feature. Furthermore, the empirical study has found that owing to geographical, demographic, legal and administrative factors the vast majority of projects in the LCI are small in terms of value.

Section two explored the procurement systems in construction projects. The empirical findings showed that the traditional procurement system is the dominant approach in organizing construction projects, and a complete design package is the most common type of design contract in the LCI. In the construction sector, a traditional or sequential contracting system, in which design is separated from physical construction, is dominant. The chapter has also identified that current forms of contracts suffer from deficiencies. In addition, it was found that, in general, manual methods are widely used in preparing tenders for construction projects. Apparently, significant numbers of initial estimates did not meet the planned budgets of projects. This failure is attributed, in general, to administrative, economic and technical factors. Thus, there are indications of overall weaknesses in the planning of pre-contracting and design phases.

It was also confirmed that the vast majority of construction projects were funded by direct advances and irregular payments by clients. It was recognized that, at the time of study, commercial banks and other financial institutions made only modest contributions to funding construction projects and the operations of construction firms owing to a variety of factors. Added to this, the selection of designers and contractors is based on competitive bidding, and the main role of contractors in the construction processes focuses only on physical construction, and design and construction are fragmented into phases. Furthermore, most buildings and small infrastructure works are carried out by Libyan consultancy and construction firms. However, large construction works are monopolized by large foreign companies.

The chapter showed that changes in design are, in general, common in the LCI and designs lack buildability. This was attributed to a number of factors, such as short periods given for design, the system of paying consultants' fees, a lack of experience and experts, errors in drawings and other contract documents and the absence of clear specifications.

Furthermore, the chapter has found that information and communication processes are based on traditional methods and channels, paper-based and verbal formats being the most dominant. Thus, it is concluded that, there are indication of weaknesses in the current design processes and information systems in the LCI.

In section four, production processes and construction resources were explored. At the time of this study the production and operations processes of the LCI are based on five basic materials including cement, steel, sand, aggregates and water. Furthermore, local private shops and small domestic firms are the major suppliers of construction materials. The main construction season in Libya is between March and October. One of the key empirical findings is that the production and operations of the LCI are based on cement products. In this context, it is argued that the LCI is a cement-based industry. The study has raised the issues of water in the operations of the LCI in particular, and in other arid and semi-arid regions and countries in general.

The empirical study in this chapter has also identified and confirmed that Libyans are under-represented in the LCI, and the vast majority of them are concentrated in managerial and professional jobs. The overall operations of the LCI have relied heavily upon foreign workers. One of the key issues to have emerged from the empirical study is that the informal sector has a vital role in the production and operations of the LCI. Finally, it is recognized that the durations of construction projects are relatively long, and delays to projects are a common feature of the operations of the LCI, as elsewhere. The study has identified the key causes of delays, and suggests that efforts should be made to eliminate their impact on the progress of projects.

Chapter Eight

8 Obstacles Constraining the Operations of the Industry

In the preceding two chapters the general characteristics of the Libyan construction industry (LCI) and its operations and key issues have been identified. The main aim of this chapter is to report on the major obstacles constraining the operations of the LCI. The chapter is divided into four main sections. Section one identifies gaps in knowledge in the LCI. Section two identifies major obstacles hindering the operations of the LCI. In section three the perceptions of clients, contractors and consultants in the LCI are explored, and section four looks at future visions of the industry.

Information in this chapter is based on the responses of the respondents to three key questions in the questionnaires and from the findings of the interviews. The Weighted Average Score of Responses (WAS), and the Average Weighted Responses (AWR) are calculated and the findings are subject to the ANOVA test where possible at the 5% significance level to weight and test the findings.

8.1 Lack of Knowledge

One of the key aims of this study is to fill in gaps in knowledge of the LCI. Therefore, throughout the theoretical and empirical studies close attention has been given to identifying how those involved in the CI in Libya understand the term 'the construction industry'. For example, from a review of the planning literature in Libya, it can be said that in Libya the construction and building sector is seen as three separate sectors comprising consulting, construction and the construction and building materials industry (see chapter four). This fragmentation may be attributed, in part, firstly to a lack of knowledge regarding the broad concepts of the construction industry (see chapter two). Secondly, there is a narrow understanding and definition of the CI and its role in economic and development processes, and thirdly the industry has been fragmented among several secretariats, departments and institutions throughout its evolution (see chapter four). In addition, it has been neglected by those involved in the development process, as in most developing countries.

Owing to the above circumstances, the vast majority of the questionnaire sample, interviewees and others concerned with the management and operations of the LCI lack

any clear understanding of the theoretical definitions of the CI. Such misunderstandings and misinterpretations are likely common elsewhere. However, they may reflect lacks of co-operation and collaboration between different sectors involved in the LCI. Therefore, to address this issue empirically, it was decided to investigate the perceptions about the CI from the point of view of decision makers and students who had finished their graduate projects in January 2004 in the architecture and civil engineering departments of Al-Fatah University in Tripoli city. They were asked to define the term 'construction industry' (see 5.7.2).

Surprisingly, the analysis of the replies shows that only one out of the six decision makers gave a clear and broad definition of the CI, which was generally consistent with the World Bank's definition (see 1.1.1). The other five defined the CI merely as those firms and organizations involved in the construction and maintenance of buildings and infrastructure works. To further understand their perceptions of the role of the CI, they were asked to specify the main role of the construction industry. All interviewees regarded the CI as a means to implement the state's development plans. Thus, it can be said that there is a lack of a theoretical understanding of the CI and its role; and on the other hand there are differences in their perceptions of the CI. These differences among decision makers may indicate that each government department has its own perception of the CI and its role.

To explore this issue within the student context with the aim to understand how the CI is learned about in Libyan educational institutions, seven students were asked a set of questions regarding the concepts and role of the CI. None of the students gave a clear definition of the CI. Five defined it as those firms producing construction materials and constructing buildings and civil engineering works. The other two students regarded the CI as those involved in construction activities. This finding may imply that the CI is introduced in engineering educational institutions as separate activities or processes, including the briefing, design and production processes.

Furthermore, at the time of this study, there are no Libyan experts in the CI as a whole. Most Libyan experts are concentrated in the construction materials and technology fields. When academics and researchers were asked to name experts and specialists in the CI as a whole in Libya, they indicated that there was no one with expertise on the CI in general. However, there are a significant number of specialists on specific aspects and activities in

the CI. This is consistent with the conclusions from the review of dissertations conducted by Libyan Masters and Doctorate students in United Kingdom universities over the past two decades (see 1.1.1). Therefore, it can be said that, at the time of this study, there is a shortage of experts in the CI in Libya. This is likely common in many countries.

From the above, two main points can be made. Firstly, there is lack of theoretical knowledge about the CI in Libya . Decision makers and others concerned with the industry suffer from misunderstandings about the CI and its organization and role.

8.2 Obstacles Constraining the Operation of the Industry

Another of the key aims of this study is to identify obstacles to the operations of the LCI. The respondents were required to answer a key question designed to identify and rank the major obstacles hindering the practices and operations of clients, consultants and contractors in the LCI. The choices given were compiled from the literature and lessons gained from past experience in working in Libya. Respondents were also invited to suggest any additional obstacles or hazards.

The respondents were asked to rank the level of influence of each obstacle or variable on firms' and organizations' operations by selecting one score from a five-point scale in which 5 indicates a very high relative influence, 4 high, 3 moderate, 2 low and 1 a very low relative influence. The analysis of the respondents' answers was based on the number of respondents and frequency distributions generated by SPSS software. Then, in order to weight and demonstrate quantitatively the relative influence or importance of each obstacle, the Weighted Average Score (WAS) and Average Weighted Respcnses (AWR) were calculated using the two formulae mentioned in section 5.8. This technique has been widely used by researchers on the CI to weight respondents' responses and perceptions (Chan et al,. 1996, p. 578; Rojas et al,. 2003, p. 79; Kartam et al, 2000, p.281; Adams, 1998, p. 141; Lyons et al, 2004, p.52; Liu et al,. 2004, p.206; Assaf et al, 2001, p. 298; and many others).

8.2.1 Obstacles Constraining the Operation of Construction Firms

Respondents from construction firms were asked to rank 22 obstacles (see appendix A: the questionnaire for construction firms). According to their relative impact on their practices and operations using the five point rating scales (see table 8.1). An examination

of the data in the table gives a general impression regarding the influence and impact of each obstacle on the operations of firms.

Table 8-1: Ranking of the obstacles constraining the operations of construction firms

Rank	Obstacles	Average Weighted Response (AWR)
1	Delay in payments	4.82
2	Lack of skilled labour	4.70
3	Unstable administration	4.58
4	Unstable laws and regulations	4.51
5	Administrators' attitudes	4.33
6	Unfair tax regime	4.33
7	Transportation costs	4.18
8	Shortage of qualified project managers	4.04
9	Lack of efficient subcontractors	4.00
10	Discontinuity of work	3.96
11	Incomplete contract documents	3.96
12	Lack of access to bank credit	3.91
13	Weakness of firms' management	3.89
14	Lack of equipment & machinery	3.86
15	Irregular supply of construction materials	3.80
16	Unwilling to co-operate	3.73
17	Lack of hard currency	3.58
18	Lack of clear specifications	3.57
19	Inefficient supervision	3.51
20	Unfair competition process	3.48
21	Inefficient contract conditions	3.41
22	Weather hazards	2.92

It is clear that nine of the 22 obstacles have an AWR of more than 4, twelve have an AWR ranging from 3.91 to 4.82 and only one has an AWR of less than 3. In general, contractors' perceptions of the influence and impacts of these obstacles are generally high. Administrative corruption, social nepotism and the low commitment of clients to the conditions of contracts were added by respondents. This indicates that most of the important obstacles associated with the operations of construction firms were probably included in the list.

For the purposes of discussion and analysis, the above ranked obstacles can be classified into three main categories: obstacles related to the operating environment (OE), which refer to the geographical, political, social, economic, legal, business and administrative environment in which the LCI operates; obstacles associated with construction firms (OCF); and obstacles related to clients and construction projects (OCP).

With regard to the above classification and the weighting of the obstacles listed, the data in table 8.1 shows that eight of the twenty two obstacles are considered as related to

the operating environment, and these have an AWR ranging from 2.92 to 4.58, with an overall average AWR of 4.0. Eight more obstacles, with an AWR ranging between 3.8 and 4.7 and an overall average AWR of 4.05, are regarded as obstacles related to construction firms; while the other six obstacles are associated with project and client aspects and have an AWR spanning between 3.51 and 4.82 and an overall average AWR of 3.8. From the above, it is clear that the five most important obstacles identified by the respondents were delays in payment, lack of skilled labour, unstable administration, unstable laws and regulations, and administrators' attitudes towards contractors, which are all related to the operating environment. In what follows, obstacles related to the operating environment, firms and clients and projects are briefly highlighted and discussed.

1. Obstacles Related to the Operating Environment

The literature on the CI shows that the issue of the operating environment and its effects on the operations of firms and on the overall performance of the industry has been investigated by several researchers (see 2.8.4). Table 8.2 illustrates the ranking of these obstacles from the point of view of the contractors.

Table 8-2: Ranking of the obstacles related to the operating environment

Rank	Operating environment' obstacles	AWR	Overall average AWR
1	Unstable administration	4.58	
2	Unstable laws and regulations	4.51	
3	Unfair tax regime	4.44	
4	Administrators' attitudes	4.33	
5	Lack of access to bank credit	3.91	
6	Unwilling to co-corporate	3.73	
7	Lack of hard currency	3.58	
8	Weather hazards	2.92	
		32	4.00

As can be seen from the above table, obstacles related to the operating environment (OE) received an overall average AWR of 4.00. Unstable administration received the highest AWR (4.58) and the lowest (2.92) was given to weather hazards. Four (50%) of the obstacles related to the operating environment had a high AWR of 4.3 or greater, while the rest had a moderate AWR ranging from 3.91 to 2.91. This gives an indication that, at the time this study, contractors considered obstacles related to the business and working environment as important restrictions on their operations. This is supported by the discussions in chapter four and the findings of the empirical study in sections 6.4.1 and 6.4.2.

From the above considerations, it is obvious that contractors regarded unstable administration, unstable laws and regulations, the unfair tax regime, administrators' attitudes and lack of access to bank credit as the most important obstacles related to their operating environment. The findings of the empirical study in the preceding two chapters also identified these obstacles (see 7.2.1 and 6.4.5). It is clear that, in such an environment, the decisions of managers might be made under conditions of uncertainty and a lack of trust. Added to this, construction firms already operate within an unpleasant working environment. This instability in the operating environment is a consequence of the intensive social and economic changes over the past decades (see chapter three). Therefore, it can be said that, owing to these unstable circumstances, the managers and clients of construction projects are unable to set up long term business strategies, as addressed in chapters two and six.

To explore the behaviour of managers in such an unstable operating environment, notes from two site managers' dairies and daily letters in three correspondence files of finished construction projects in Tripoli city were examined (see 5.7.3). These showed that, as a result of the unstable and uncertain operating environments, the managers of most construction firms adopted a responsive management system or a short-term business strategy to lead their firms and to enable them to survive (see section 6.4.5). Furthermore, when decision makers were interviewed and asked to indicate the most general difficulties facing the operations of the LCI, their replies cited the unstable institutional, administrative and legal environment as the most important factors.

A manager at one of the five construction projects which was visited during the empirical study said that: "we are working in an uncertain and unstable environment. For example, our firm signed a large construction contract but, after a year or so, the client (public sector) suspended and then cancelled the contract". However, no compensation was paid to contractors. Consequently, construction policies and programmes lack credibility.

Contractors evidently considered obstacles related to the operating environment as important and influential obstacles restricting their practices and operations. Thus, it can be said that unstable legal and institutional framework have affected (and are still affecting) the current shape and operations of the LCI. Therefore, great efforts should be made to

eliminate the impacts of the above obstacles. In this regard, a set of recommendations are suggested in chapter nine.

2. Obstacles Associated with Construction Firms

In this section the obstacles related to construction firms in the LCI are considered. Table 8.3 shows the ranking of these from the point of view of contractors. Of the 22 obstacles, eight were related to the resources of firms such as labour, equipment, management and the firm's workload.

Table 8-3: Obstacles related to construction firms

Rank	obstacles related to Construction firms	AWR	Overall average AWR
1	Lack of skilled labour	4.70	
2	Transportation costs	4.18	
3	Shortage of qualified project managers	4.04	
4	Lack of efficient subcontractors	4.00	
5	Discontinuity of work	3.96	
6	Weakness of firms' management	3.89	
7	Lack of equipment	3.86	
8	Irregular supply of construction materials	3.80	
		32.43	4.05

The overall average AWR of these obstacles was 4.05, which makes them the most important category of obstacles to the LCI. Four related to construction firms received AWRs ranging between 4.7 and 4.0. This suggests that contractors considered lack of skilled labour, transportation costs, shortages of qualified project managers and the lack of efficient subcontractors as the most influential obstacles restricting their operations.

The four remaining obstacles were the discontinuity of work, weaknesses in management, lack of equipment and irregular supplies of construction materials, which have AWRs ranging between 3.96 and 3.80 indicating that they had a moderate influence on the operations of firms. These findings supported the opinion of contractors (see 7.4.3, 7.2.5, 7.4.6 and 7.4.2).

From the above, it is obvious that, from the point of view of contractors, the issue of skilled labour and site managers were regarded as the key obstacles restricting the operations of contraction firms. The literature on the CI in developing countries considers this issue as one of the major problems for local construction firms (see 2.7.3). In the Libyan case, the country's small population and limited workforce means that shortages of skilled and experienced construction workers is inevitable. This is supported by the

findings in chapters three and four and sections 4.6.3 and 7.4.3. Furthermore, the results confirm the argument that one of the key issues in the LCI is construction workers. Therefore, close consideration should be given to human resources in the CI when formulating construction and employment policies, as addressed in section 7.4.3.

Also, the cost of transportation of construction input (materials, labour, equipment, etc.) was ranked second with an AWR of 4.1 (see table 8.3). The cost of transportation is relatively high in Libya owing, in part, to the country's large area, as addressed in chapter three. Therefore, manufacturing policy should take into account this issue and small local firms should be encouraged to invest in manufacturing indigenous construction materials (see 6.4.5 and 7.4.2). Such a policy would help in reducing transportation costs. Lack of qualified project managers and efficient subcontractors were ranked third and fourth with AWRs of 4.04 and 4.0 respectively, indicating that they have important influences on the operations of construction firms in the LCI.

In short, it is clear that contractors regarded shortages of skilled labour, project managers and efficient subcontractors, as well as the costs of transportation of construction materials and the discontinuity of work, as the five most important obstacles restricting their operations. Therefore, it can be said that labour and training are two crucial issues in the LCI. The future operations of the LCI and its ability of cope with managerial, institutional and technical changes would be associated with those two issues.

3. Obstacles Constraining Clients and Construction Projects

This section presents and discusses obstacles related to clients and projects. The ranking of these obstacles in table 8.4 reveals that, of the 22 obstacles, 6 are associated with clients and construction projects.

Table 8-4: Ranking of obstacles related to clients and projects

Rank	Obstacles related to Construction Projects	AWR	Overall average AWR
1	Delay in payments	4.82	
2	Incomplete contract documents	3.96	
3	Lack of clear specifications	3.57	
4	Unfair competition process	3.48	
5	Inefficient contract conditions	3.41	
6	Inefficient supervision	3.51	
		22.57	3.79

Contractors considered delays in payments, and incomplete contract documents as the most important obstacles constraining the clients' practices and the progress of construction projects. These were also identified by respondents when they were asked about their last three projects in sections 7.2.4, 7.2.5 and 7.4.6. The overall average AWR of the obstacles constraining clients and construction projects was 3.79.

Delays in payments received the highest AWR (4.82). These are considered as one of the most influential factors which affect the operations of the LCI. Contractors often complained to clients because they delayed payment of their bills. The other four obstacles are related to the ways in which projects are organized and managed. A plausible interpretation is that design and contract documents lack buildabilty (see chapter two). This would also support the empirical findings in the preceding two chapters of this study, particularly those in chapter seven which indicate that the traditional procurement system is dominant in the LCI and that designs lack buildability.

To sum up this section, delays of payments to construction firms and poor buildabilty in construction projects were the most important and influential obstacles related to clients and projects which restricted the operation of construction firms.

8.2.2 Obstacles Constraining Consultancy Firms

Designers were asked to consider and rank 16 obstacles related to their practice and operations (see appendix A: the questionnaire for consultancy firms). The resulting perceptions of the designers are presented in table 8.5.

As can be seen from the data in this table, eight of the obstacles have an AWR of more than four, which indicates that they were regarded by consultants as having a strong influence on their practice and operations. Seven more have AWRs between 3.00 and 3.73, while one obstacle has an AWR of 2.96. These can be understood to have a moderate influence on consultants' practice and operations

Therefore, consultants considered delays in payments, the discontinuity of work, the unclear scope of projects, unstable administration and a lack of clear and efficient specifications as the five most dominant obstacles which hindered their practices and operations. These are in line with the findings in sections 7.1.3, 7.2.5 and 7.4.6 and the discussions in chapter four. In addition, the respondents were asked to add any other

important obstacles. The short periods of time given to their firms to complete design work, and social and administrative nepotism were stated to restrict their operations and affect their efficiency. For the purpose of analysis and discussion, the above ranked obstacles are classified into three main categories, as in the preceding section.

Table 8-5 : Ranking of the obstacles constraining the operation of consultancy firms

Rank	Obstacles	AWR
1	Delay in payment	4.50
2	Discontinuity of work	4.46
3	Unclear scope of client's project	4.39
4	Unstable administration	4.35
5	Lack of clear specifications	4.30
6	Shortage of specialist professionals	4.25
7	Lack of efficient local contractors	4.13
8	Client changes of mind	4.04
9	Separation between design and construction	3.96
10	Unfair tax regime	3.73
11	Lack of technical equipment	3.52
12	Unfair competition process	3.48
13	Inappropriate planning and design regulations	3.17
14	Unstable laws and regulations	3.13
15	Poor administrators' attitude towards consultants	3.00
16	Lack of efficient contract documents	2.96

1. Obstacles Related to Clients and Construction Projects

As can be seen in table 8.6, consultants considered obstacles related to clients and projects with an AWR of 3.85. Five of these obstacles have an AWR above 4.00, which indicates that they were regarded as having a strong influence on their practice and operations, while the remaining four obstacles have AWRs between 2.96 and 3.96 indicating that they have a moderate influence.

The perceptions of consultants agree with those of contractors regarding some of these obstacles, such as delays in payment and the lack of efficient contractors (see 8.2.1). Moreover, the findings in the preceding chapters have also identified those obstacles in sections 6.4.5, 7.2.1, 7.2.5 and 7.4.6.

From the above, it is clear that delays of payments to consultancy firms and the inability of clients to state precisely their needs and requirements were regarded as the most important and influential obstacles related to clients and construction projects which affected the practice and operations of consultants. This raises the issue of sources of

finance of construction projects and their impact on the operations of firms in the CI (see 7.2.1), and the buildability of design and contract documents.

Table 8-6: Obstacles associated with clients and projects

Rank	Obstacles related to clients and construction projects	AWR	Overall average AWR
1	Delay in payment	4 50	
2	Unclear scope of client's project	4.39	
3	Lack of clear specifications	4.35	
4	Lack of local efficient contractors	4.13	
5	Client changes of mind	4.04	
6	Separation between design and construction	3.96	
7	Unfair competition process	3.48	
8	Inappropriate planning and design regulations	3.17	
9	Lack of efficient contract documents	2.69	
		34.7	3.85

2. Obstacles Associated with Firms

A glance through the obstacles in table 8.7 shows that they are all related to firms. These obstacles are associated with firms' workload, and the lack of experts and technical and engineering equipment. The consultants ranked these the most important group of obstacles, with an overall average AWR of 4.08. These obstacles were also identified by the respondents in sections 6.2.4, 6.4.5 and 8.1. Great efforts should therefore be made to consider this issue when formulating construction policies and educational and training plans.

Table 8-7: Obstacles related to consultancy firm

Rank	Obstacles related to firms	AWR	Overall average AWR
1	Discontinuity of work	4.46	
2	Shortage of specialist professionals	4.25	
3	Lack of technical equipment	3.52	
		12.23	4.08

From the above, it is clear that the consultants were very concerned with the obstacles which had direct impacts on their practice and operation. Introducing information technology and training professional staff are of considerable significance in eliminating and overcoming these barriers as will be recommended in chapter ten.

3. Obstacles Related to the Operating Environment

Surprisingly, the findings show that consultants were not so concerned about the obstacles related to the operating environment when ranking them. As can be seen in table 8.8, the four obstacles received average AWRs ranging from 3 to 4.35. The consultants

ranked them as the third most important category of obstacles related to consultancy firms with an overall average AWR of 3.55 having only a moderate influence on their practice and operations. This can be attributed to the consulting business only being involved in the design phase (see sections 7.2.4 and 7.4.5). Comparison between the perceptions of contractors and consultants reveals that contractors were more concerned with obstacles related to the operating environment, and ranked them with an overall average AWR of 4.00 (see section 8.2.1).

Table 8-8: Obstacles related to the operating environment

Rank	Obstacles related to the operating environment	AWR	Overall average AWR
1	Unstable administration	4.35	
2	Unfair tax regime	3.73	
3	Unstable laws and regulation	3.13	
4	Poor administrators' attitudes towards consultants	3.00	
		14.55	3.55

As can be seen from the above data, unstable administration, the tax regime and laws and regulations as well as poor attitudes among administrators towards consultants were regarded as the most important obstacles related to the working environment of consultancy firms. However, their AWRs indicated that they were considered as only having a moderate influence on their practices and operations. This in general agrees with contractors' opinions (see 8.2.1.

In short, at the time of this study, unstable administration and institutions, the unfair tax regime and unstable laws and regulations were the worst obstacles related to the operating environment of consultancy firms. This suggests that the state and other bodies concerned with this isse should make great efforts in order to stabilize and improve the operating environment.

8.2.3 Obstacles Constraining Clients and Projects

Clients of construction projects were required to rank 13 different obstacles which might be considered to affect their practice and role in the CI (see appendix A: the questionnaire for clients). The list was based on the literature and previous experience. As the data in table 8.9 shows, eight obstacles had AWRs ranging from 4.1 to 4.8, having an important influence on the practice and performance of clients. The remaining five obstacles had AWRs ranging between 2.9 and 3.9. This indicates that they were not regarded as so important by clients. It was also noted that a large number of the clients

regarded low financial stability and the capability of local construction and consultancy firms as major obstacles restricting their performance.

As can be seen in the table, the five most important obstacles affecting clients in their practice and performance were delays in construction projects, the high cost of construction, high cost overruns, high levels of disputes with contractors, and the poor environment for investment in construction. In this context, the term high indicates to greater than the usual level. As discussed in chapter two these obstacles exist in most developing countries (see 2.8.4). As in the preceding two sections, the above ranking obstacles are classified into three categories relating to operating environment, firms and clients and projects.

Table 8-9: Ranking of obstacles hindering clients' practice

Rank	Obstacles hindering clients of construction projects	AWR
1.0	Delay of construction projects	4.8
2.0	High cost of construction	4.6
3.0	High cost overrun	4.6
4.0	High disputes with contractors	4.5
5.0	Poor investment environment in construction	4.4
6.0	Unstable administration	4.4
7.0	Shortage in land for construction	4.2
8.0	Lack of efficient local contractors	4.1
9.0	Shortage in experienced consultancy firms	3.9
10.0	Uncertain legal environment	3.9
11.0	Poor cooperation during construction process	3.8
12.0	Lack of access to financial sources	3.6
13.0	Complex project-approval process	2.9

1. Obstacles related to the Clients and Projects

It has been argued in this study that efforts should be made to increase the participation of the private sector in financing construction projects and the development of construction resources (see 2.8, 7.1.2 and 7.2.1). It is believed that the first important step in this regard is to eliminate obstacles related to client. As can be seen from table 8.10, five of the obstacles related to client practice and operations were considered as being associated with clients and projects. All of these were considered by the clients as having a very strong influence on their practices and on project progress, with AWRs ranging from 4.2 to 4.8. The overall average of the AWR of these obstacles was 4.5, and these were the

most important of the three categories related to clients. As mentioned previously, delays to projects, high cost overruns, the high cost of construction and high levels of disputes with contractors were the most dominant obstacles. Also, shortages in land for construction was recognized as one of these obstacles..

Table 8-10: Ranking of obstacles related to clients and projects

Rank	Obstacles related to clients and projects	AWR	The average AWR
1	Delay of projects	4.8	
2	High cost overrun	4.6	
3	High cost of construction	4.6	
4	High disputes with contractors	4.5	
5	Shortage in land for construction	4.2	
		22.7	4.5

These results are generally associated with financial and operational aspects, and agree with the findings in chapter seven that the low efficiency of initial estimates, delays to projects and the traditional procurement system are some of the key features of the LCI. In short, it is clear that, as elsewhere delays and cost overruns of projects are the major key obstacles that were considered most important by the clients. Those can be considered as weaknesses in the current operation of the LCI.

2. Obstacles related to the Operating Environment

The data shows that clients were less concerned than consultants about the obstacles related to the operating environment. As can be seen in table 8.11, five obstacles were considered as having direct and indirect influences but clients ranked them least important of the three categories of obstacles, with an average AWR of 3.8.

Table 8-11: Ranking of obstacles associated with the operating environment

Rank	Obstacles related to operating environment	AWR	The average AWR
1	Poor investment environment in construction	4.4	
2	Unstable administration	4.4	
3	Uncertain legal environment	3.9	
4	Lack of access to financial sources	3.6	
5	Inappropriate planning regulations and procedures	2.9	
		19.2	3.8

As can be seen from the above table, the poor environment for investment in construction and unstable administration received AWRs of 4.4, while the uncertain legal environment, lack of access to financial resources and inappropriate planning regulations

and procedures received AWRs of 3.9, 3.6 and 2.9 respectively. These results agreed with contractors and consultants' views regarding the instability of their operating environment (see chapters three, four, six and seven).

This may lead to the conclusion that the legal and institutional framework of the LCI should be modified (see chapter four). In addition, financial services and planning regulations, particularly those relevant to land for construction, also require assessment and development in order to encourage clients to increase their investment in construction. In this regard, decision makers, financiers, researchers, and site managers were asked in interviews about the key urgent actions which needed to be taken in order to improving the work circumstances and operating environment in the LCI. There was a consensus among them that the first step is to rethink the legal environment relevant to the organization of the LCI and its associated processes and activities.

3. Obstacles Related to Firms

This section presents the obstacles related to firms from the point of view of clients. As can be seen in table 8.12 only three of the obstacles were directly relevant to firms The clients regarded the lack of efficient local contractors and experienced consultancy firms and poor cooperation during the construction process as the most important problems related to consultancy and construction firms which restricted their practice and performance. They ranked them as the second most important of the three categories of obstacles related to clients, with an overall average AWR of 3.9.

Table 8-12 Ranking of obstacles related to firms from the point of view of clients

Rank	Obstacles related to firms and resources	AWR	The average AWR
1	Lack of efficient local contractors	4.1	
2	Shortage in experienced consultancy firms	3.9	
3	Poor cooperation during construction process	3.8	
		11.8	3.9

The lack of efficient local contractors received the highest AWR (4.1) of these three obstacles, which agrees with the results in sections 8.1.2 and 8.4.6. Therefore, as has been suggested before, the training of staff in the CI, and particularly of contractors, is of significance as mentioned in sections 6.2.3, 6.2.4 and 6.5.4.

All in all, as can be seen in table 8.13, contractors considered obstacles related to their firms and operating environment (with an AWR of 4.05 and 4.0 respectively) as the most important and influential obstacles impeding their operations, while, in the opinion of clients, obstacles related to projects (with an AWR of 4.5) were the most important factors restricting their practice and performance. However, consultants regarded obstacles related to firms and their resources (with an AWR of 4.08) as the most important obstacles restricting their practices and operations. The possible reasons behind these differences might lie in their educational background, qualifications and their different roles in the operations of the LCI (see chapter two and sections 6.2.4, 7.3.5 and 7.3.1).

Table 8-13: Ranking of the three major groups of obstacles constraining the LCI

	Obstacles		
Groups	Operating environment (AWR)	Firms (AWR)	clients and projects (AWR)
Contractors	4.0	4.05	3.7
Clients	3.8	3.9	4.5
Consultants	3.5	4.08	3.8
Overall	3.7	4.00	4.2

According to the perceptions of consultants, clients and contractors, a total of fifty one obstacles constrained their practices and operations. Seventeen of these were classified as obstacles related to the operating environment, 20 as obstacles associated with clients and construction projects, and the others were relevant to construction and consultancy firms. In general, consultants and contractors regarded obstacles related to clients and projects as more important than those related to the operating environment and firms. However, this may reflect serious obstacles related to the role of clients in the CI and the organization of projects in the LCI, as addressed in chapters three, four, six and seven. Therefore, the ownership structure and role of the private clients in the LCI and the organization of construction projects require assessment and development. As can be seen in table 8.13, the overall average AWRs of obstacles related to the operating environment, firms and clients and projects were 3.7, 4.0 and 4.2 respectively. This indicates that all obstacles were regarded as important by contractors, consultants and clients.

In brief, three types of obstacles were identified; those related to the operating environment, consultants and construction firms, and clients and construction projects. It is evident that instability has been (and is) the most influential obstacle restricting the operations of the LCI, providing a large part of the answer to the research question 'Why is Libya's construction industry (LCI) as is it now?' Chapter nine suggests a set of

recommendations to remedy these obstacles and eliminate their influence on the operations of the LCI.

8.3 Perceptions of the Libyan Construction Industry

This section explores the perceptions of contractors, consultants and clients concerning the general characteristics of the LCI. The respondents were asked to consider and state their views regarding thirteen different statements relevant to the general characteristics and operational aspects of the LCI (see appendix A and table 8.14). This list was created from the literature, previous experience, the visual survey, and visits to the place of the study in the early stages of the research (see 5.4.1).

The respondents were asked to rank their agreement or disagreement using a five-point scale where strongly disagree = 1, disagree = 2, undecided = 3, agree = 4 and strongly agree = 5. This scale was adopted owing to its simplicity, popularity and suitability for measuring the respondents' views, and because it allowed statements and responses to be ranked and compared.

Table 8-14: Statements concerning the general characteristics and operations of the LCI

Statements
S 1. Clients prefer to contract with foreign contractors rather than Libyans
S 2. Employment in construction is not attractive for Libyan workers
S 3. Contractors were viewed as bourgeois exploiters over the past two decades
S 4. Tribal and friendship relationships are important in obtaining work
S 5. Consulting sector lacks experience in design and project management
S 6 Construction activities are based on cement and concrete
S 7 Consultants and construction firms get all their payments on time
S 8 During operation and production processes, there is a huge amount of waste materials
S 9 Projects are not completed within planned budgets and contractual duration
S 10 The administrative, economic and legal context restricts the industry's operation
S 11 Local consultants and contractor firms have a good reputation
S 12 Construction activities consume much water
S 13. Projects are separated into design and construction phases

The responses were also compared with information from the semi-structured interviews (see section 5.7.2). Then, the Average Weighted Scores (AWS) and Average Weighted Responses (AWR) were calculated. Finally, the ANOVA test was conducted in order to investigate whether there were statistically significant differences between the views of the respondents. It was found in section 6.3.2 that significant numbers of the respondents had considerable experience in working in construction and its associated

activities. This gives an indication that their opinions and views regarding the above statements will be reliable and realistic. For the purposes of analysis and discussion, the findings are divided into three sections as follows:

8.3.1 Contractors' Perceptions of the Libyan Construction Industry

Table 8.15 give a general impression of the overall perceptions of contractors about the statements. As can be seen in the table, 33.4 per cent of the overall answers of the contractors regarding the thirteen statements were in strong agreement, 37.9 per cent were in agreement, 8 per cent were undecided, while 15.9 per cent disagreed and 4.9 per cent strongly disagreed. Therefore, most of the contractors (71.3%) agreed with most of the statements.

Table 8-15: Responses and ranking of the statements by contractors

Rank	Number of statements	Number of respondents scoring N=72					AWS	AWR
		5=S.G	4= A	3 =U	2=.D	1=S.D		
1	Employment in construction	43.0	25.0	1.0	2.0	0.0	322.0	4.5
2	Unstable environment	40.0	26.0	2.0	2.0	0.0	314.0	4.5
3	Construction based on cement	42.0	23.0	1.0	6.0	0.0	317.0	4.4
4	Delay to projects	33.0	27.0	4.0	8.0	0.0	301.0	4.2
5	Consultants lack experience	26.0	34.0	5.0	5.0	0.0	291.0	4.2
6	Construction consumes much water	30.0	27.0	4.0	7.0	4.0	288.0	4.0
7	Clients prefer foreign firms	27.0	25.0	10.0	10.0	0.0	285.0	4.0
8	Separation process	26.0	28.0	8.0	7.0	3.0	283.0	3.9
9	Tribalism impacts on operations	18.0	34.0	8.0	6.0	4.0	266.0	3.8
10	A huge amount of waste materials	12.0	39.0	9.0	12.0	0.0	267.0	3.7
11	Contractors were exploiters	10.0	33.0	11.0	16.0	2.0	249.0	3.5
12	A good reputation	0.0	21.0	3.0	33.0	13.0	172.0	2.5
13	Payments on time	3.0	9.0	8.0	33.0	19.0	160.0	2.2
Total /overall		33.4	37.9	8.0	15.9	4.9	270.4	3.8

Furthermore, the top ranking seven (53.8 per cent) of the thirteen statements received AWSs ranging from 285 to 322, and had average AWRs between 4.0 and 4.5. This indicates that contractors exhibited strong agreement with these statements. Also, the four statements ranked 8 to 11 (30.8%) had AWSs ranging from 249 to 283 and average AWRs between 3.5 and 3.9, indicating that contractors did not strongly agree with these statements. The other 2 (15.4%) statements ranked twelve and thirteen received AWSs of between 172 and 160 and average AWRs between 2.5 and 2.2. This indicates that the contractors strongly disagreed with these two statements. The overall average AWS and AWR of the contractors' responses were 270.4 and 3.8 respectively. On average respondents therefore tended to agree with the statements.

From the above, it is clear that the contractors exhibited strong agreement with the statements concerning employment in construction, the unstable environment, that construction in Libya is based on cement, delays to projects, that Libyan consultants lack experience, construction consumes much water, and clients prefer foreign firms. Contractors were thus very concerned with statements relevant to their operating environment. This suggests that their perceptions reflect the real situation in their working environment, which supports the findings in section 8.2.1. Furthermore, the contractors give little concern to the statements concerning separation between design and construction, tribalism's impact on the operation of the industry, waste materials during production processes, and contractors being viewed as exploiters in the past two decades. However, the contractors strongly disagreed with the statements concerning local consultants and construction firms having good reputations, and the invoices of contractors being paid on time. When these perceptions are compared with the empirical findings in chapters six and seven and sections 8.2, it is clear that they are compatible. This increases the reliability of the study's findings. Furthermore, the results from the semi-structured interviews conducted with decision makers, researchers and academics showed that, in general, there is a consensus among interviewees that the statements give an accurate picture of the general characteristics of the CI in Libya. However, the degree of agreement or disagreement with the statements among interviewees varies owing to differences in their role and background.

Thus, the perceptions of contractors about the thirteen statements fluctuated between strong agreement and strong disagreement. However, the contractors exhibited strong agreement with those statements relevant to their operating environment, such as those relevant to employment, delays in payment, and production processes. It is not surprising that contractors consider the LCI as an industry with a poor reputation.

8.3.2 The Consultants' Perceptions of the Statements

In this section the perceptions of consultants about the thirteen statements concerning the LCI and its operations are discussed. An examination of the data in table 8.16 shows that 37.2 per cent of the overall statements received strong agreement, 25 per cent agreement, 11.9 per cent undecided, 17 per cent disagreement and 9 per cent strong disagreement. These percentages indicate that most of the respondents (62.2%) agreed with most of the statements.

The top ranking eight statements (61.5%) had AWRs between 4 and 4.5.These include statements concerning construction consuming much water, the unstable environment, delays to projects, contractors being described as exploiters over the past two decades, and employment in construction (see table 8.16).

Table 8-16: Perceptions and ranking of the statements from the point view of consultants

Rank	Number of statements	Number of respondents g N=72						
		5=S.G	4= A	3 =U	2=.D	1=S.D	AWS	AWR
1	Construction consumes water	15.0	7.0	2.0	0.0	0.0	109.0	4.5
2	Unstable environment	17.0	2.0	5.0	0.0	0.0	108.0	4.5
3	Delay to projects	13.0	8.0	3.0	0.0	0.0	106.0	4.4
4	Contractors were exploiters	13.0	8.0	3.0	0.0	0.0	106.0	4.4
5	Employment in construction	12.0	9.0	3.0	0.0	0.0	105 0	4.4
6	Construction based on cement	14.0	7.0	0.0	1.0	2.0	102.0	4.3
7	Separation of process	9.0	9.0	6.0	0.0	0.0	99.0	4.1
8	Clients prefer foreign firms	10.0	8.0	3.0	3.0	0.0	97.0	4.0
9	A huge amount of waste materials	6.0	11.0	3.0	4.0	0.0	91.0	3.8
10	Tribalism impacts on operations	7.0	9.0	2.0	6.0	0.0	89 0	3.7
11	Consultants' experience	0.0	0.0	2.0	14.0	8.0	42.0	1.8
12	Payments on time	0.0	0.0	3.0	12.0	9.0	42.0	1.8
13	A good reputation	0.0	0.0	2.0	13.0	9.0	41.0	1.7
Total /overall		37.2	25.0	11.9	17.0	9.0	47.4	3.6

The comparison between consultants' and contractors' perceptions regarding these statements (see table 8.15.) shows that, in general, there is a consensus between the two sets of perceptions. However, it is noted that consultants gave more concern to technical and knowledge-based aspects such as the relationship between water and production processes.

The two statements (15.4%) ranking nine and ten received AWRs of 3.8 and 3.7. These are that 'production processes generate a huge amount of waste materials' and 'tribalism affects the operations of the industry'. Consultants exhibited only slight agreement with these statements. The lower three statements (23.1%) were that Libyan consultants lack experience, contractors obtain payments on time and that the LCI has a good reputation. These received AWSs ranging between 41 and 42 and average AWRs between 1.7 and 1.8. This suggests that the consultants strongly disagreed with these statements. A comparison between the perceptions of contractors and consultants shows that there are differences in the rankings of the statements. This can be attributed to the nature of their work and differences in qualifications and education as well as experience (see 6.2.3, 6.2.4 and 6.3.2). However, it is clear that both consultants and contractors exhibited strong

disagreement with the two statements that local consultants and contractors have a good reputation and that contractors get their payments on time.

These results support the findings in chapters four and seven. However, exploration of the respondents' disagreements with some of the statements indicates that consultants did not agree with the statement that they lacked experience in construction management. In contrast, the contractors ranked this statement fifth highest. This implies that consultancy firms should improve their design and operation management. Added to this, they also disagreed that they received their payments without any delay. It is suggested that clients should consider this problem as an important obstacle resulting from their badly planned project budgets and performance.

To identify whether there were any significant statistical differences between contractors and consultants in their opinions on the statements, a statistical analysis using ANOVA at the 5% significance level was undertaken.

Table 8-17: ANOVA results for contractors and consultants regarding the statements

Statements	Mean		One-way ANOVA	
	Contractors n=72	Consultants n=24	F	Sig. level P
Clients prefer foreign firms	2.68	1.96	3.101	0.082
Employment in construction	2.04	1.63	3.319	0.072
Contractors were exploiters	1.46	2.79	56.895	0.00
Tribalism impacts operations	2.54	2.29	0.937	0.335
Consultants lack experience	2.31	4.25	53.40	0.00
Construction based on cement	1.9	1.75	.0379	0.539
Payments on time	1.60	4.25	180..90	0.00
A huge amount of waste materials	3.78	2.21	37.750	0.00
Delay to projects	2.29	1.58	11.363	0.001
Unstable environment	1.82	1.50	2.089	0.152
A good reputation	1.53	4.29	301.503	0.00
Construction consumes much water	3.61	1.46	73.237	0.00
Separation process	2.00	1.88	0.235	0.629

As can be seen in table 8.17, there are significance statistical differences between contractors and consultants' views on seven of the statements. However, the test did not show any statistically significant differences in the perceptions of contractors and consultants for six statements. As already mentioned, these differences can be attributed to differences in the work context and background which will be discussed in the following sections.

To sum up this section, consultants see the LCI as an industry operating within an unstable administrative and institutional environment (see chapter three and four). Generally, in the eyes of consultants, the industry has a poor reputation and image.

8.3.3 Clients' Perceptions of the Statements

As mentioned in section 2.8, without clients construction demand cannot be generated and projects cannot be funded. Therefore, the perceptions of clients of the CI and its operations is an important indicator of the degree of satisfaction with the performance and quality of the industry. Therefore, in this section the perception of clients about the general characteristics of the LCI is discussed.

The clients exhibited strong agreement with many of the propositions (see table 8.18). An examination of data shows that the top seven (53.9 %) statements had AWRs between 4.7 and 4.0. These included the statements concerning employment in construction, the unstable environment, construction being based on cement, delays to projects, consultants lacking experience, construction consuming much water, and clients preferring foreign firms (see table 8.18). These results agree with the findings in sections 8.2.1, 8.2.2 and 8.2.3.

Table 8-18: Perceptions and rankings of the statements from the point of view of clients

Rank	Number of statements	Number of respondents scoring N=12						
		5=S.G	4= A	3 =U	2=.D	1=S.D	AWS	AWR
1	Employment in construction	8.0	4.0	0.0	0.0	0.0	56.0	4.7
2	Unstable environment	9.0	1.0	2.0	0.0	0.0	55.0	4.6
3	Construction based on cement	7.0	5.0	0.0	0.0	0.0	55.0	4.6
4	Delay to projects	6.0	4.0	2.0	0.0	0.0	52.0	4.3
5	Consultants lack experience	5.0	5.0	0.0	2.0	0.0	49.0	4.1
6	Construction consumes much water	4.0	6.0	1.0	1.0	0.0	49.0	4.1
7	Clients prefer foreign firms	4.0	4.0	4.0	0.0	0.0	48.0	4.0
8	Separation of processes	6.0	2.0	1.0	3.0	0.0	47.0	3.9
9	Tribalism impacts on operations	2.0	7.0	1.0	2.0	0.0	45.0	3.8
10	A huge amount of waste materials	0.0	8.0	2.0	2.0	0.0	42.0	3.5
11	Contractors were exploiters	2.0	4.0	1.0	4.0	1.0	38.0	3.2
12	Payments on time	0.0	5.0	3.0	4.0	0.0	37.0	3.1
13	A good reputation	0.0	0.0	2.0	5.0	5.0	21.0	1.8
Total		34.0	35.3	12.2	14.7	3.8	45.7	3.8

The five (38.5%) statements ranked between eight and twelve had AWRs between 3.1 and 3.9, suggesting that clients exhibited only slight agreement. These included statements about the separation of processes, tribalism's influence on operations in the industry, production processes generating a huge amount of waste materials, contractors being viewed as exploiters, and contractors getting their payments on time. The final statement that local consultants and contractors have a good reputation received an AWR

of 1.8. This suggests that clients strongly disagreed with this statement, as did both contractors and consultants.

The ANOVA test (at the 5% significance level) showed significant differences between clients and contractors regarding four of the statements; these concerning contractors being viewed as exploiters, the reputation of local contractors and consultants, production processes consuming much water and generating huge amount of waste materials (see table 8.19). The test also revealed that there are also statistically significant differences between the contractors and clients' perceptions regarding three statements about delays in payment to contractors, construction being an undesirable occupation for Libyans and delays to construction projects.

Table 8-19: ANOVA results in relation to the statements among clients and contractors

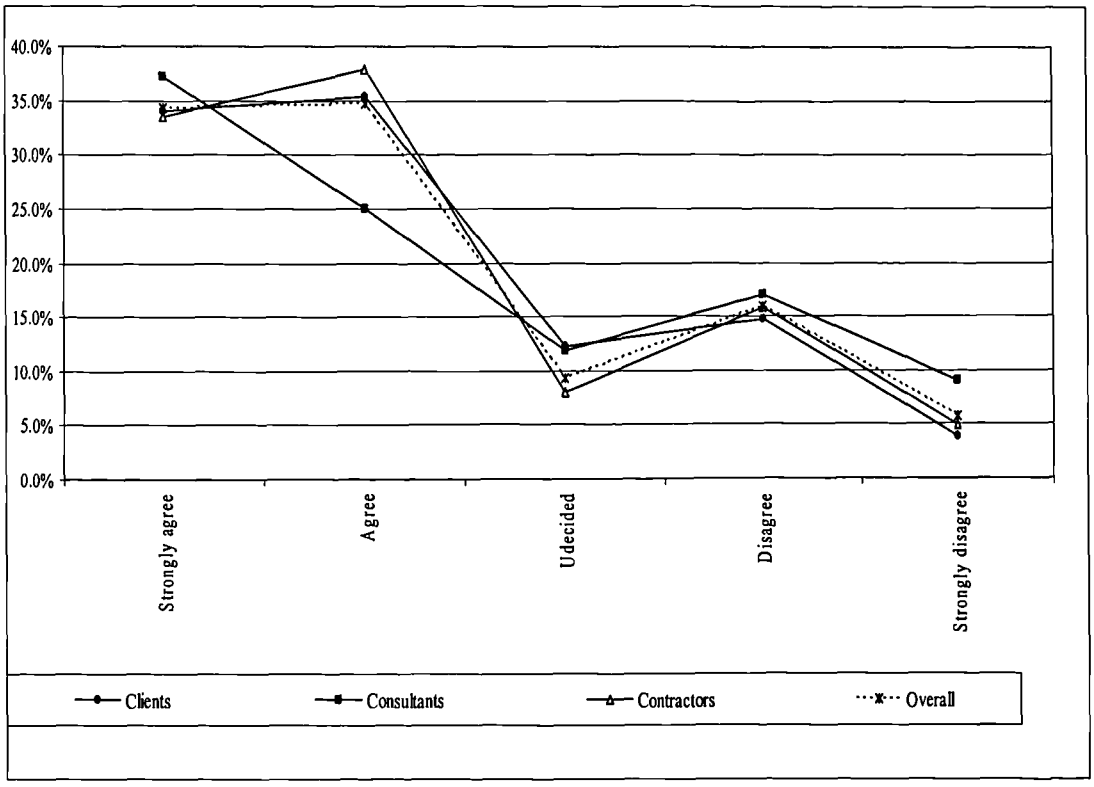
Statements	Mean		One-way ANOVA	
	Contractors n=72	Clients n=12	F	Sig. level P
Clients prefer foreign firms	2.68	1.92	1.833	0.180
Employment in construction	2.04	1.33	5.320	0.024
Contractors were exploiters	1.46	2.92	43.183	0.000
Tribalism impacts operations	2.54	2.83	0.707	0.403
Consultants' experience	2.31	2.08	0.320	0.573
Construction based on cement	1.90	1.67	6.628	0.430
Payments on time	1.60	2.50	11.030	0.001
A huge amount of waste materials	3.70	2.25	20.360	0.000
Projects delay	2,29	1.42	9.815	0.002
Unstable environment	1.82	1.42	1.850	0.176
A good reputation	1.53	1.92	155.500	0.000
Construction consumes water	3.61	1.92	22.009	0.000
Separation process	2.00	2.00	0.00	1.000

As mentioned previously, these differences can be attributed to differences in responsibilities and rights, educational and qualification levels and experience in construction (see 6.2.3, 6.2 .4 and 6.3.2). In addition, some of the statements are more relevant to contractors rather than clients. Furthermore, the test did not show any significant statistical differences between clients and contractors' opinions regarding six statements concerning clients preferring foreign companies, the operations of the industry being based on cement and concrete, the industry operating in an unstable operating environment, and design and construction processes being fragmented. This agreement in the perceptions of contractors and clients may be evidence that these statements reflect some of the key features of the LCI.

All in all, more than 34 per cent of the statements received strong agreement from all respondents, where 37.7 per cent agreed, and 9 per cent were undecided, 16.3 per cent

disagreed and 5.7 per cent strongly disagreed (see figure 8.1). The figure gives a general impression that the majority of the statements elicited agreement from the respondents. The statements concerning clients preferring to contract with foreign companies, employment being unattractive for Libyans, the unstable administrative, economic and legal context, production processes consuming much water, and construction being fragmented (see figure 8.2 and table 8.20) received high AWRs. This indicates that these were regarded as most important features of the LCI at the time of this study.

Figure 8-1 A breakdown of the overall responses of constructors, consultants and clients



However, some statements received low AWRs such as statements number five, seven and eleven concerning the Libyan consulting sector lacking experience, contractors getting their payments on time, and local contractors having a good reputation (see figure 2.8). This suggests that the respondents disagreed with these statements. The other statements received moderate AWRs indicating that they were not thought so important by the respondents.

In order to test whether there are significant statistical differences between the perceptions of contractors, consultants and clients about the statements of the general characteristics of the LCI, an ANOVA statistical test was undertaken. The results in table

8.21 show that there are significant differences between the groups of respondents for eight (61.5%) of the statements.

Figure 8-2: Ranking of the statements from the point view of the group.

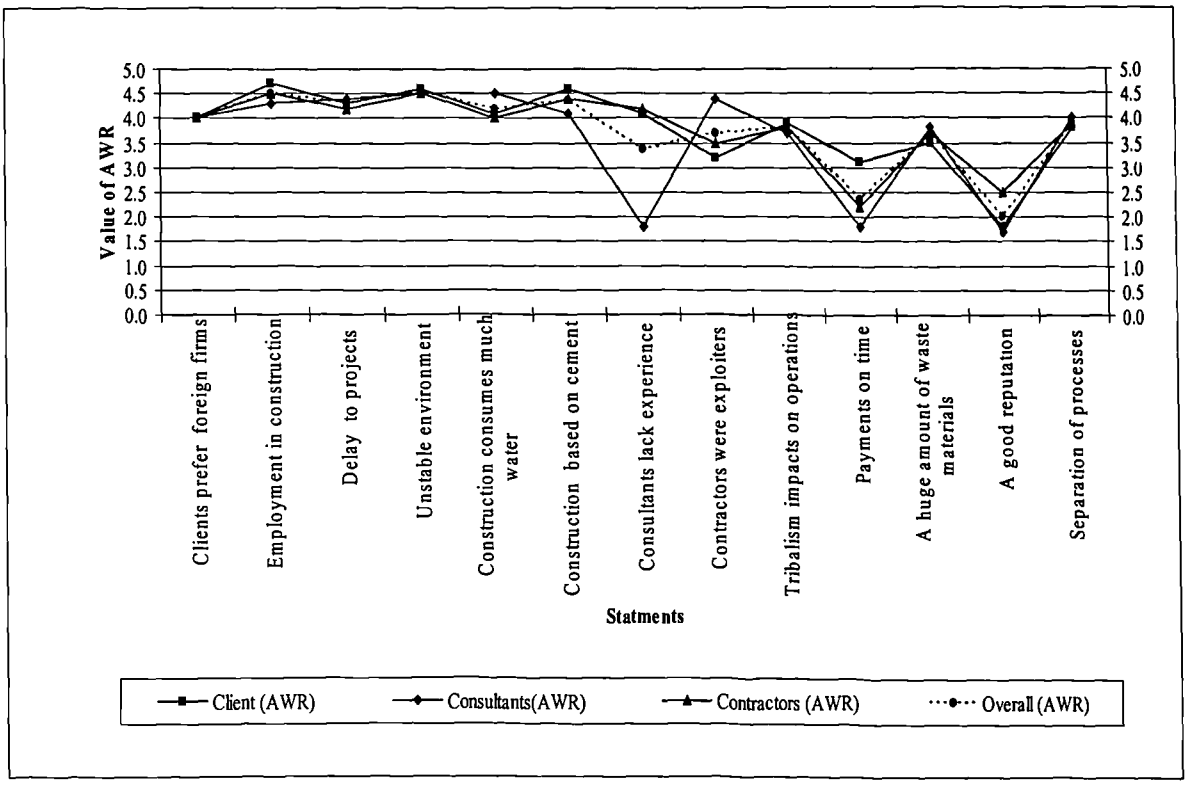


Table 8-20: Ranking of the statements from the point of view of the group.

Statements	Client (AWR)	Consultants (AWR)	Contractors (AWR)	Overall (AWR)
Clients prefer foreign firms	4.0	4.0	4.0	4.0
Employment in construction	4.7	4.3	4.5	4.5
Delay to projects	4.3	4.4	4.2	4.3
Unstable environment	4.6	4.5	4.5	4.5
Construction consumes much water	4.1	4.5	4.0	4.2
Construction based on cement	4.6	4.1	4.4	4.4
Consultants lack experience	4.1	1.8	4.2	3.4
Contractors were exploiters	3.2	4.4	3.5	3.7
Tribalism impacts on operations	3.9	3.7	3.8	3.8
Payments on time	3.1	1.8	2.2	2.4
A huge amount of waste materials	3.5	3.8	3.7	3.7
A good reputation	1.8	1.7	2.5	2.0
Separation of processes	3.8	4.0	3.9	3.9

These included that it is undesirable for Libyans to work in construction, that contractors were viewed as exploiters over the past decades, operations and production processes generate a huge amount of waste of construction materials, Libyan consultants lacked experience, delays in payments to contractors, delays to projects, local consultants

and contractors having a good reputation and the operations of the LCI consuming lot of water. The reasons underlying these differences have been mentioned in the preceding sections.

Table 8-21: ANOVA results in relation to the statements among the clients, consultants and contractors

Statements	Mean			One-way ANOVA	
	Contractors n=72	Consultants n=24	Clients n=12	F	Sig. level
S1	2.68	1.96	3.3	2.328	0.102
S2	2.04	1.63	1.33	4.042	0.020
S3	1.46	2.79	2.92	38.538	0.000
S4	2.54	2.29	2.83	0.976	0380
S5	2.31	4.25	2.08	27.787	0.000
S6	1.90	1.75	1.67	0.398	0.673
S7	1.6	4.25	2.5	91.766	0.000
S8	3.78	2.21	2.25	25.276	0.000
S9	2.29	1.58	1.42	9.622	0.000
S10	1.82	1.5	1.42	1.729	0.183
S11	1.53	4.29	4.25	193.875	0.000
S12	3.61	1.46	1.92	41.740	0.000
S13	2.00	1.88	2.000	0.127	0.881

However, the test also did not show any significant statistical differences between contractors, consultants and clients regarding their opinions on five statements (38.5%). These concern clients preferring to contract with foreign contractors rather than Libyans, tribalism affecting the operations of the LCI, the operations and production processes of the LCI being based on cement and concrete, the unstable and uncertain environment restricting the operation of the LCI, and construction processes being separated into design and construction phases.

To conclude this section it can be said that the general characteristics of the LCI are similar to the features of the CI in most developing countries (see 2.8). The analysis in this section has shown that there are statistically significant differences between clients, consultants and contractors in perceptions about the LCI. These are attributed to differences in their responsibilities and roles as well as to their educational and qualification levels in construction. However, on the other hand, there are no differences in the perceptions of contractors, consultants and clients regarding some aspects of the LCI. Generally, it can be said that the weakness of the LCI is that it is characterized by traditional processes and operations. In addition, the industry has a poor image, as in many other parts of the world (Dulaimi et al, 2004, p.699). This reflects that contractors, consultants and clients are not satisfied with the industry in terms of its environment,

organization, management, supervision and performance. Therefore, efforts should be made to assess and eliminate the causes of these low levels of satisfaction.

8.4 The Future of the Libyan Construction industry

Respondents and interviewees were asked to state their views regarding the future of the LCI in terms of growth in the size and scale of construction activities in Libya's construction market in the coming years. Nearly, forty nine per cent (49 respondents) of the total survey sample (consultants, contractors and clients) believed that the CI will flourish in the coming years (see table 8.22).

Table 8-22: Future of the LCI

	Contractors (%)	Consultants (%)	Clients (%)	Overall (%)
Flourishing	50.0	45.8	16.7	45.4
Stable n its situation	6.9	8.3	8.3	7.4
Slowdown	5.56	4.17	16.7	6.5
Don't know	6.9	33.3	41.67	16.67
Geting worse	23.6	8.3	8.3	18.5
No answer	6.9	0.0	8.3	5.6
Total	100.0	100.0	100.0	100.0

Decision makers were also asked to state their views regarding this issue. Analysis of their replies shows that four out of the six decision makers interviewed strongly believed that the operations of the LCI and associated sectors will flourish in future years. Three main reasons emerged form their responses: firstly, the currently strong commitment of the government to tackling the problem of housing shortages (see 3.5.4 and appendix B). This is supported by the Secretary of the People's Committee (Prime Minister) in Libya (Ghanem, 2005): "There is a lack of houses and residential units. We need more than 270 thousand residential units. Tripoli itself needs 95 thousand units. By 2010 the figures will reach 300 thousand". In addition, in September 2005 the foundations for the construction of 50,000 housing units were established in Tajoura, 20 kilometres east of Tripoli (www.gpc,gov, 2005). Secondly, since international sanctions were cancelled in 2003 the government has given close intention to infrastructure and repair and maintenance projects at both national and local levels. Thirdly, the government has issued a series of laws with the aim to encourage foreign companies and organizations to invest in construction and the tourism industry, such as Law No.5 of 2004 concerning foreign investment. In this regard, the Secretary of the People's Committee in Libya (Ghanem, 2005) argued that "The Secretariat of the General People's Committee (Council of Ministers) issued resolution No.

5 to facilitate economic projects in tourism, agricultural, oil, and industrial fields. All these projects aim to offer jobs, improve the national income and find solutions to unemployment problems" (Ghanem, 2005). Fourthly, the rapid increase in oil prices over the past three years has encouraged the government to increase its investment in construction activities.

To identify whether Libyan consultancy and construction firms are capable of coping with the future national demand for construction, a question was asked about this subject in semi-structured interviews with decision makers, academics, researchers and site managers. There was a consensus among all interviewees that, according to the current operational situation of the LCI, there is still a growing need for foreign construction workers and firms, particularly in large and sophisticated civil projects. This is supported by the findings in chapter seven.

In conclusion, as a consequence of the rapid social and economic development of the country, construction activities will increase in terms of size and scale in the future decades.

8.5 Summary and Conclusion

The purpose of this chapter was to identify the major obstacles hindering the practices and operations of the key actors of the LCI. Furthermore, it explores the perceptions of clients, consultants and contractors about the general characteristics of the LCI and identifies the key feature of the operations of the industry. The first section has identified misconceptions about the term 'construction industry' among those concerned with the construction industry in Libya. It appears that the LCI lacks clear theoretical and conceptual understanding. The study argues that decision makers, and technical, managerial and operational staff of the LCI should be trained, and high levels of qualification of Libyans in the CI should be also encouraged. The next section identified, ranked and categorized the major obstacles constraining the operations of the LCI. Three major groups of obstacles have been identified, including those related to the operating environment, those associated with firms, and those relevant to clients and construction projects. Statistical analysis demonstrated that all obstacles are regarded as having important and influential impacts on the operations of the industry. It appears that creating an enabling operating environment for the CI is important and urgent. Added to this, it is

argued that the relationships among different obstacles and their impact on the overall operations, performance and efficiency of the industry require future research.

The perceptions of consultants, contractors and clients in the LCI were discussed in section three. Despite the fact that statistical analysis showed some differences among consultants, contractors and clients regarding the thirteen statements relevant to the general characteristics of the LCI, the overall perceptions about the industry are generally similar. In the eyes of consultants, contractors and clients as well as others concerned, the LCI is a set of separate activities organized and managed by traditional procurement systems which relies heavily upon foreign workers. Generally, as elsewhere, the industry has a poor image. Finally, the chapter has investigated future visions of the LCI in terms of the growth of construction activities. Unsurprisingly, the overall views of contractors, consultants, clients and others involved in the industry suggest that the LCI will flourish in the coming years. This can be attributed, in general, to the increase in the country's construction needs and requirements. However, the study argues that the day when local construction industry can be relied upon is still far away. A significant proportion of large and sophisticated projects will continue to be undertaken by international firms.

Chapter Nine

9 Discussion of the Key Findings

9.1 Introduction

Summaries and conclusions for all chapters have made throughout this thesis. The main aim of this chapter is to bring together and organize the emergent evidence and key findings of the different chapters in order to answer the research questions, achieve the research objectives and to identify strengths, weakness, opportunities and threats for the LCI. Then, in the following chapter, the conclusions, recommendations, implications and limitations of this study are presented. The structure of this chapter is guided by the research questions and objectives. In addition, SWOT[26] (strengths, weaknesses[27], opportunities[28] and threats[29]) analysis is employed to assess the current status and operations of the LCI

9.2 SWOT Analysis

Based on the model of the CI (figure 2.2), and the findings and discussion throughout the theoretical and empirical studies, it can be said that the current organization of the LCI fits the proposed model of the CI in figure 2.2. The processes and operations of the LCI have been shaped (and are being shaped) by several main components, or sub-systems, including: construction restrictions or regulations; construction resources or inputs; construction services and mechanisms; construction processes and operations; and finally, physical output or products. The findings and discussions in the preceding chapters reveal that there are strengths and weaknesses of, opportunities for and threats to the LCI's key components or sub-systems.

In this section a SWOT analysis is employed to identify the current status and operations of the LCI. As can be seen in table 9.1, the strengths and weaknesses represent

[26] . SWOT analysis is a useful tool to identify strengths, weakness, opportunities and threats for an organization. This method was developed by Abert S. Humphry who died on 31 October 2005 (see. http://www.businessballs.com)

[27]. This term refers to lack of resources and managerial, financial and technical capability to operate efficiently.

[28]. The term opportunity refers to external factors which may be utilized to enable the CI to operate efficiently.

[29]. The term threat indicates external factors which are considered as dangers and risks to the CI and its operations.

internal issues and factors related to the industry itself, while opportunities and threats refer to external factors.

Table 9-1: SWOT analysis of strengths, weaknesses, opportunities, and threats in the LCI.

Key Strengths Internal factors	**Key Weaknesses** Internal factors
Restrictions and regulations - Organization based on partnership system **Construction resources** - Numbers of Libyans engineers, technicians and firms have increased - Well educated, qualified and experienced staff - Occupational stability of managers **Construction services and mechanisms** - Firms had considerable workloads - Large number of subcontractor firms - Sizable informal construction industry - The industry has considerable experience - Good market in the hiring of construction equipment - Dominance of small firms - Good access to work and construction	**Restrictions and regulations** - Sudden and frequent changes in regulations - The CI is viewed as service sector - Marginal role of the private sector -.The industry is fragmented - Instable operating environment **Construction resources** - Lack of data, information and studies. - Shortages of skilled workers, site mangers and experts as well as basic materials - Operations are based on cement and concrete - Operations depend on oil revenues **Construction services and mechanisms** - No institution responsible for the CI - Lack of specialist and large firms - Poor communication and information - Low qualifications of contractors - No clear and systematic supply channels - Inefficient management and training systems - Delays in payments and to projects - Loss of construction and project management - Low perceptions, reputation and training and image **Construction processes and operations** - Separation of processes and operations - Lack of co-operation and collaboration
Opportunities External factors	**Threats** External factors
Restrictions and regulations - Reorganization of the economy and the LCI **Construction resources** - The CI is seen as a profitable business - Good investment in education and training in construction - Demand for new construction and maintenance - The LCI will flourish in the coming years **Construction services and mechanisms** - The state is committed to developing a national construction industry - Increase of the involvement of the private sector and foreign investment in construction	**Restrictions and regulations** - Regular and sudden changes in regulations, organization of the industry, its related departments and institutions, and trade barriers **Construction resources** - Harsh environment - Limited human resources - Scarcity and quality of water - Collapse of oil prices and finite resources - Unstable exchange rate of the LD **Construction services and mechanisms** - Administrative corruption - Tribalism impacts on operations

This type of analysis is widely used in business to describe and assess the operation and performance of an organization, and is used here as a convenient summary of the major findings of this study concerning critical issues for the LCI (see table 9.1). The

following sections briefly discuss the internal (strengths and weaknesses) and external (opportunities and threats) factors shaping the current operations of the LCI and identify their impact on the current status of the LCI. Furthermore, the influences of the current operations of the LCI on the industry itself and its geographical, social and economic environments as well as its capability to cope with future changes, challenges and threats are highlighted. The analysis and discussions are based on the model of the CI in figure 2.2.

1. Strengths and Opportunities

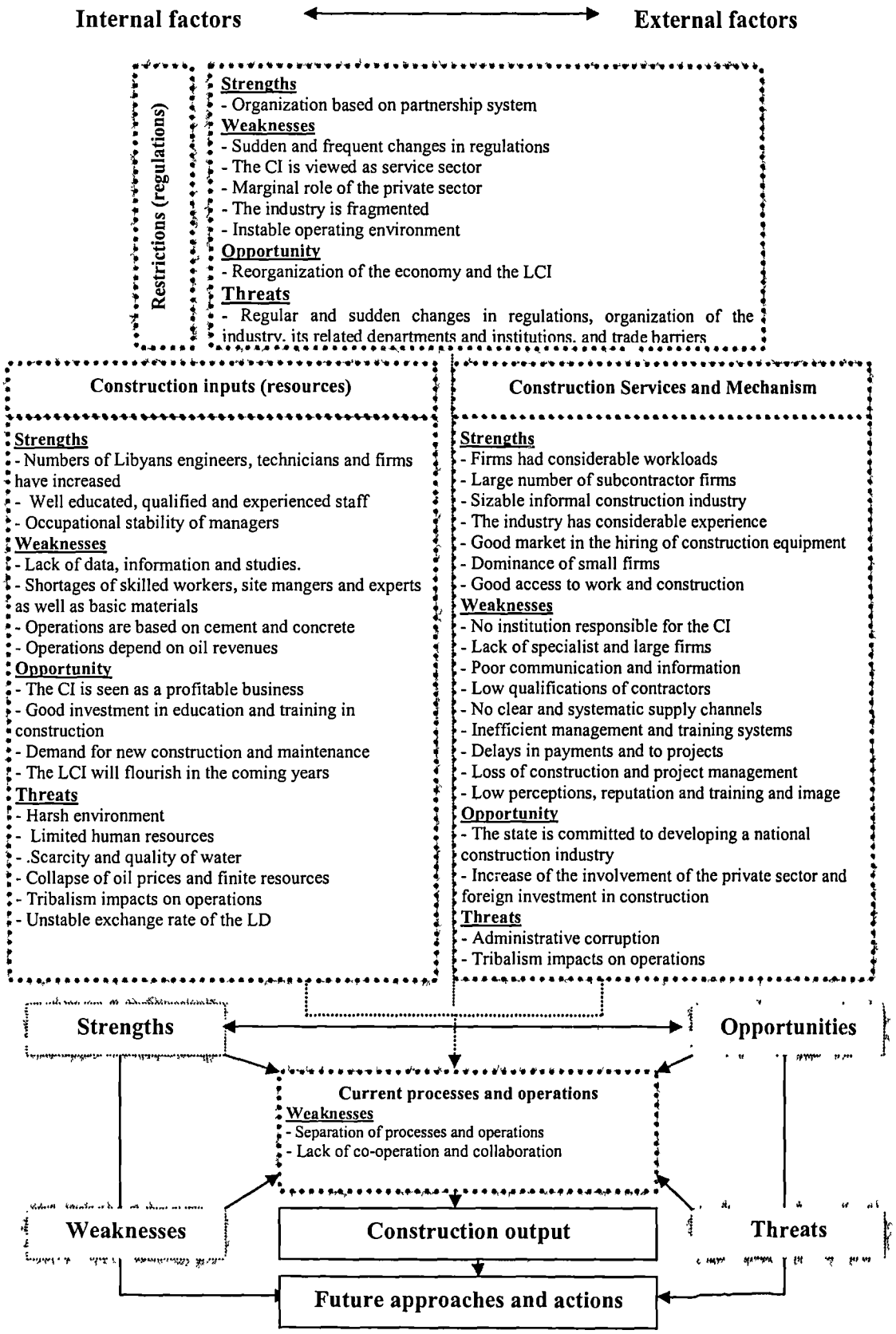
The SOWT analysis (see table 9.1 and figure 9.1) shows that the LCI has strengths and opportunities to improve its operations and to grow to be able to cope with future social, economic, institutional and technological changes and challenges. Three important key strengths give the LCI this capability. Firstly, the staff and operators of the industry are generally well educated, stable and experienced; secondly, the industry comprises a large number of small firms and sub-contractor firms. Added to this, there is a sizable informal construction sector; and the state encourages Libyans to participate in the CI in terms of operation and investment.

Furthermore, the SWOT analysis also shows that there are several opportunities to develop the LCI and its associated processes (see table 9.1). These include the strong commitment of the state to develop the national construction industry; demand for construction will flourish in the coming years and the CI is seen as a profitable business. However, the restrictions and weaknesses in current regulations, construction resources, services and mechanisms and construction procurement systems and operations and their impact on the current status and operations of the LCI should be remedied (see figure 2.2, table 9.1 and figure 9.1). A set of recommendations in this regard are suggested in the following chapter.

2. Weaknesses and Threats

The SOWT analysis (see table 9.1 and figure 9.1) gives a strong impression that there are indications of overall weaknesses in the current status and operations of the LCI. Based on the model of the CI (see figure 2.2), it can be said that the key weaknesses in the LCI lie in the current regulations/restrictions, including that the CI is viewed as a service sector, lack of data and information, sudden and frequent changes in regulations, the marginal role for the private sector, and delays in payment to contractors.

Figure 9-1: The current operation, strengths and weaknesses of, opportunities for and threats to the LCI and future actions and approaches.



Also, the analysis reveals that there are indications of weaknesses in current construction resources in terms of the complete reliance of the operation of the industry on oil revenues and cement and its related products. Added to this, shortages in Libyans skilled workers, managers and experts as well as basic construction materials (cement and steel) and land for construction purposes are regarded as weaknesses (see figure 9.1).

Furthermore, the analysis also shows that there are overall weaknesses in current construction services and mechanisms (see table 9.1 and figure 9.1). These include lacks of specialist and large firms, the industry is fragmented, no institution is responsible for the CI's planning and supervision, no clear and systematic supply channels, low qualifications of contractors, inefficient management and training systems. Finally, the SWOT analysis indicates that the current processes and operations of the LCI suffer from deficiencies and weaknesses in terms of separation of design and construction processes, poor communication, information systems and channels and design lacks buildability These weaknesses are, in part, responsible for the current operations and performance in terms of low capacity and capability, delays to projects, high cost overruns and the poor image and reputation of the industry. A set of recommendations are suggested to remedy these weaknesses in the following chapter.

Moreover, the SWOT analysis in table 9.1 and figure 9.1 shows that the current and future operations of the LCI are and would be threatened by many risks. These include Libya's harsh and sensitive fragile environment, the scarcity and quality of water, limited human resources in terms of quantity and quality and the tribal structure of the social environment. In addition, sudden collapses of oil prices, that its current reserves will dry up in the coming four decades, and the unstable regulatory and institutional environment are also considered as threats to the current and future operations of the LCI (see table 9.1 and figure 9.1). The study argues that these threats should be considered by politicians, planners, the industry's staff and operators. Furthermore, the LCI should be planned in terms of regulations, resources, services, mechanisms and operations to eliminate the influence of these threats on future operations. Conclusions and recommendations regarding these issues are suggested in chapter ten.

3. Impact of the Current Operations

When considering the impact of the current status and operations of the LCI on its context, it can be said that the industry has had a remarkable positive impact on Libya's

social, economic and development processes as in other countries. However, there are many negative impacts associated with its current operations in terms of its insignificant contribution to employment of Libyans, the industry lacking the capacity and capability to manage national construction needs and requirements (see table 9.1 and figure 9.1). Also, its operations are also based on a pool of foreign workers and large projects are undertaken by foreign enterprises.

Furthermore, the current operations of the LCI are associated with the dominance of the state in terms of ownership and finance, design and contractual documents lack buildability, delays to projects and in payments are common, as are high cost overruns. Moreover, the current operations of the LCI do not consider Libya's geographical characteristics and its fragile environment. Management of limited national resources such as water and lands suitable for life and development are generally affected by the current operations of the industry. However, owing to time limitations, these impacts (such as the position and proportion of water in the current operations of the LCI in terms of quantity, quality, cost and management) have emerged as issues which require specific future research (see chapter nine).

4. Future Actions and Approaches

At this stage of this study, the future directions and approaches of the LCI can how be addressed. Based on the findings of this study and the SWOT analysis, it can be said that there can be some optimism about developing the operations of the LCI and to prepare it to manage changes in the society, economy, market and technology in terms of organization, management and operations. This requires rethinking the LCI. The term rethinking in this context refers to short-and long-term dynamic actions and strategies to reshape the industry to be able to operate efficiently, and to responded effectively to future changes and challenges in terms of regulations and procedures, resources, services and mechanisms, processes and operations and the type and quality of products and services. There are many key reasons underlying this call for rethinking the industry. For example, the current operations are unable to meet national construction needs and requirements. Secondly, there are overall weaknesses in the LCI and threats to its current operations (see table 9.1 and figure 9.1). Thirdly, the industry has strengths and some opportunities to be developed; and finally, changes in external factors (political, social, economic, technological and competitive trends) should be considered (see chapters three and four). Added to this

according to the current rate of extraction of oil in Libya, its reserves will dry up in 50 years or so (Ibrahim, 1987 p.282). This raises serious threats to Libya's economy as well as to the LCI. As a result, politicians and planners should take these threats into account when formulating construction policies and plans.

Based on preceding discussions and table 9.1 and figure 9.1, the following sections discuss the key findings of the study. For the purpose of reviewing and clarifying the relevant findings within a framework, in relation to the research questions and objectives, and to the key issues of the proposed model of the LCI (see figure 2.2), the findings are discussed under the following main headings. Restrictions and regulations, construction resources, construction services and mechanism, obstacles impeding operations and the future of the industry.

9.3 Restrictions and Regulations

This section provides a concise summary and discussion of the main findings relevant to the key restrictions and regulations forming the current status and shape of the CI.

9.3.1 The Current Status of the Industry

The evolution of the contemporary Libyan construction industry (LCI) was closely associated with political independence, the sudden influx of oil revenues since the beginning of the 1960s, the intensive urbanisation processes in the 1960s, 1970s and 1980s, and the national ambitions to accelerate social and economic development . The CI has played a leading role in social and economic development processes in Libya over the past decades, as elsewhere. Currently, it is an important service sector which is involved in all of the processes and operations concerned with producing the physical built environment. The LCI contributed 5.3 per cent of GDP and it employed around 3.2 per cent of the total workforce in 2003 (see chapters three, four and seven). The study argues that the current status of the industry will affect the future of the LCI and its ability to cope with social, economic, technological and business changes and challenges. Thus, the CI should be rethought and considered as an important and dynamic production sector in its own right. This requires redefining the role, scope and position of the CI in the nation's economy. A set of key conclusions and recommendations in this regards are suggested in the following chapter.

9.3.2 Key Factors Shaping the Industry

This section discusses the key findings regarding the key external and internal factors shaping the Libyan construction industry.

1. Geographical, Social and Economic Operating Environment

Libya is characterized by desert and semi-desert land, high and extreme temperatures, a scarcity of water and geographical dispersion. In reality, Libya is comprised of four separate regions. In planning terms, it can be said that Libya is an archipelago consisting of four oases or islands separated by large dry deserts. Thus, the CI operates in a highly restrictive geographical environment (see chapter three). Consequently, the operations of the CI are concentrated in the four main local markets (Tripoli, Benghazi, Alkalej and Sabhah); and the overwhelming majority of construction activities are concentrated in the northern regions in general and in the Tripoli and Benghazi region in particular. The market is divided into four small local markets which are separated by wide desert distances (see chapter four).

Thus, it can be said that there are weaknesses in the LCI's operating environment. Limited natural resources (water and land suitable for development), extreme temperatures, and geographical dispersion should be regarded as serious obstacles facing the operations of the LCI (see table 9.1 and figure 9.1). Therefore, four key issues should be considered. Firstly, any attempt to develop the CI should consider its geographical context. Secondly, planners and operators should consider the issue of water used in construction materials, technologies, processes and operations. Thirdly, transportation and communication are important factors in such operating environments; and fourthly, the application of one set of national construction standards, codes and specifications as well as regulations covering all the regions of the country should consider the differences in geographical and climatic conditions.

Secondly, Libya has limited human resources in terms of population size within a large country in terms of land area. Thus, in the context of a SWOT analysis (see table 9.1 and figure 9.1), the impact of demographic and social structure on the LCI and its operations can be regarded as weaknesses in the industry; lack of labour is one of the key challenges for the LCI. In addition, tribalism and associated cultural patterns such as nepotism have a long history and deep roots in Libyan society. Large numbers of firms are established on the basis of social and tribal roots, and access to construction resources, services and business are generally influenced by social relationships and nepotism.

Moreover, family, tribe and friendship relationships are important channels of communication and sources of information about projects. Such circumstances might affect managers' decisions, the organization and management of firms, and the credibility of competition and tendering processes. In addition, they may cause a lack of trust as well as increasing levels of risk and corruption in the industry's operating environment.

It seems that, in the near future, the LCI would not free itself from the influence of tribalism and its associated attitudes. Added to this, the tribal structure in Libyan society suits the informal construction sector rather than the formal one. Thus, several questions arise, such as how the CI operates in the tribal context; or how tribal principles could be utilized to serve the CI and its operations and contribute to social and development plans. To answer these questions, the influence of tribalism and social nepotism on organizations and the operations of the CI in Libya needs to be investigated in a specific study.

Thirdly, oil revenues determine the volume of the state's economic investment in construction and the operations of the LCI, as in other oil producing Arabic countries (see chapters three, seven and eight) . However, the instability of the Libyan economy over the past three decades owing, in part, to its complete reliance on oil production, has affected the operations of the LCI in terms of the scale and volume of construction activities, the suspension of projects, delays in payments to contractors and to projects.

2. Critical Changes in Construction Processes and Operations

In a span of five decades, the operations of the LCI have changed from indigenous construction activities based on local construction materials and methods, social and construction skills and design where production and operations process were led by clients, builders and craftsmen, to a contemporary construction industry guided by professionals, organized around projects and operated by firms (see chapters four and seven). These changes in organization, and the nature and characteristics of the CI and its products can be considered as the most important turning points in the history of construction in Libya. Local construction knowledge, skills and experience were neglected and replaced by new construction technology, equipment and machinery. It is concluded that these technical and organizational changes were inevitable if social and economic development aspirations for a modern built environment were to be achieved.

Therefore, it is argued that, the current modern construction technology and operational processes of the LCI have not developed as a consequence of a full understanding of Libya's geography, climate, traditional construction experience and skills, resources, economy and society and in response to its fragile and marginal environment, but as a consequence of the modern construction production and operational methods themselves, which were developed in countries not suffering, for example, from acute shortages of water and land suitable for life. Added to this, no attempts have been made to adapt and develop construction productions and operations to suit Libya's fragile geographical environment, because Libya lacks the technological capability for this. Thus, it seems that there are overall weaknesses in the relations between the current construction technology and operations of the LCI and its geographical context (see table 9.1 and figure 9.1). However, the influence of construction resources, technology on the operations of the LCI is not fully investigated in this study owing to time constraints. It is suggested that this issue should be investigated in a further study.

3. Water in Construction Operations in Arid and Semi-arid Countries

Libya is a country which suffers from acute shortages in water supplies, and yet the current operations of the LCI are cement based. Thus, the current operations and processes of the LCI are designed around mixing methods in which water is a key factor in terms of quality, quantity and management (see chapters three, four, seven and eight). This includes water used for producing construction materials and curing concrete on construction sites. Generally, as addressed in chapter three, in arid and semi-arid countries and in Libya in particular, politicians and planners consider water as a serious challenge for social and economic development. Thus, throughout the course of this study, the issue of water emerged as an important construction resource in the operations of the LCI in terms of the management of limited natural resources. It seems that in coming years, the most serious threat to Libya's development in general and the CI in particular is the scarcity of and quality of water. It is believed that such circumstances will put more intensive pressure on Libya's limited water resources. Thus, it can be said that there are weaknesses in the planning of current construction technology and operations (see table 9.1).

4. Current Organization and Structure

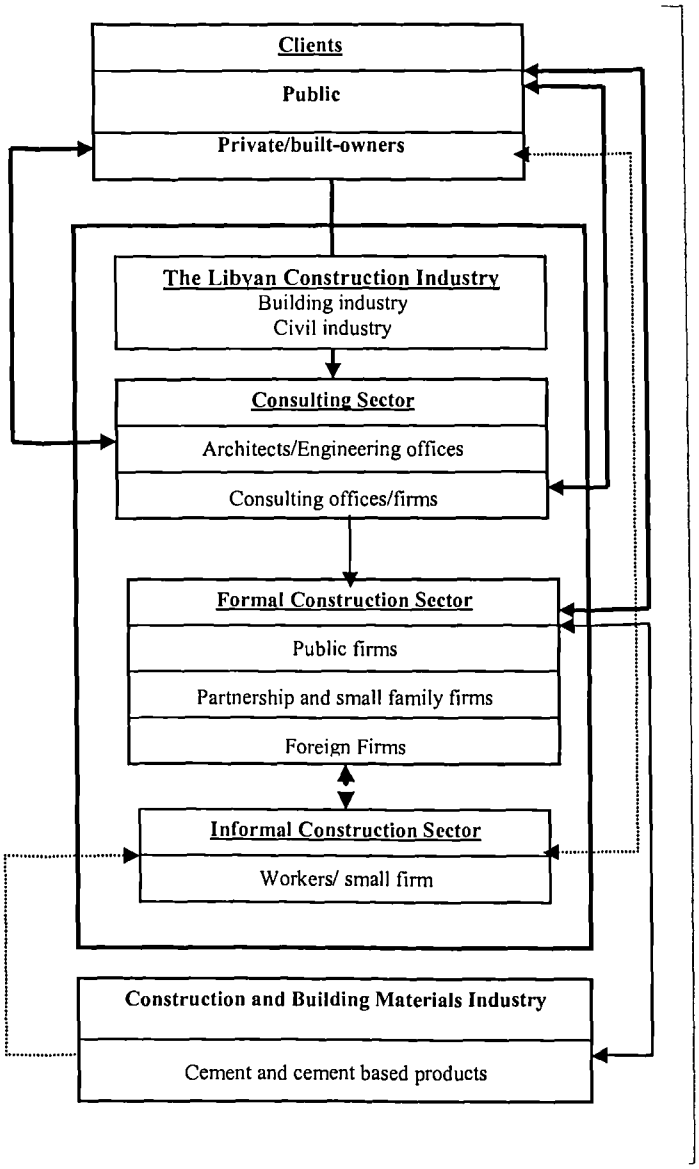
Political issues have played a significant role in determining the size, scope, organization, operations and shape of the LCI and its sub-sectors. The state has been a

sovereign power in the regulation, investment, management and operations of the CI in Libya over the past three decades (as in most other developing countries). Political ideology has adopted the principles of socialist laws, which affected the organization and structure of the LCI and its associated operations. The partnership and cooperative system is the main legal framework to form and run firms in the LCI. Currently, domestic partnerships (Sharika Musahima) and cooperative family firms (Tasharrukyya) are dominant (at nearly 88%) in the LCI. Added to this, at the time of this study there is no sole ownership or one-man firm in the current structure of the LCI (see chapters three, four, six and eight). Thus, political factors are one of the key factors which form the current organization and structure of the LCI and affect its operations in terms of firms' size, stability, capital and marginal capability, as well as their business relationships and culture. Recently, a new approach has been adopted to emancipate the CI from the dominance of political ideology and to encourage individuals and the private sector to be involved in the CI. However, the process of change is slow, for various economic and administrative reasons.

Currently, the industry comprises the consulting and construction sectors and the building materials industry (see chapters six, seven and eight). However, in practice, the industry is fragmented and widely seen as separate sectors. It has been mentioned that the informal construction sector is beyond the main scope of this study. However, the study found that, despite the intention of the state to regulate and control construction activities in accordance with formal construction standards, informality is one of the key features of the LCI. The sector has a key role in the LCI in terms of production processes and the supply of construction materials and labour (as in most developing countries). It is believed that, owing in part to Libya's social structure and the influence of tribal culture, attitudes and relationships, the informal construction sector will grow in the coming years. However, no official or academic attention has been given to this sector. The sector is under-studied; and as a result, its contribution to construction, the GDP and employment has not yet been recognized.

Based on the model of the CI (see 2.9 and figure 2.2), SWOT analysis (table 9.1 and figure 9.1 and the findings, discussion and conclusions throughout this study, the composition and structure of the LCI is presented graphically in figure 9.2.

Figure 9-2: Composition, structure and operational relationships in the LCI



It is clear that the processes and operations of the LCI are conducted by public and private clients, consulting sector (architects/engineering offices and consultants sector), a formal and an informal construction sector (public, partnership, co-operative, foreign and informal firms) and a construction and building materials industry which is based on cement and its products. This model is, in general, similar to the structure of the CI in other Arabic countries such as Algeria, Egypt, Jordan, Saudi Arabia and Kuwait. Lack of coordination, cooperation and fragmentation of the industry are some of the main features of such a structure. This affects the operations of the CI in terms of delays in payment to contractors and to projects as well as the separation of construction processes into many phases, as addressed in chapters six, seven and eight.

5. Unstable Operating Environment

Despite Libya having enjoyed the advantages of political stability in recent decades, its social, economic, legal, institutional and administrative context has undergone a series of intensive changes since the second half of the 1970s (see chapters three and four). The study has reached the conclusion that the CI in Libya has operated according to many different political, legal, institutional, social and economic development strategies, and several administrative and structural systems and forms of state intervention. These include changes in organization and structure, the working environment and relationships between the participants involved in the management and operations of the LCI (see chapter three). Such an unstable operating environment threatens the CI in terms of the fragmentation of the industry's supervision, planning and management, changes in the organization and ownership of firms, a lack of trust in the operating environment, and inflation.

In this sense, the current status of the LCI is, in part, the result of this instability in its operating environment. This is one of the key answers to the question of why the LCI is as is it now. In this sense, the instability of the operating environment is one the key external factors which have influenced the operations of the LCI in terms of size of workload, firm turnover rate, changes in firm organization, and the clients of projects, flow of information and delays in payment and to projects. Therefore, this instability is regarded as a weakness in the LCI's operating environment. A set of recommendations in this regards is suggested in the following chapter.

9.4 Construction Resources

Construction resources are one of the key factors which have affected (and are affecting) the current nature, characteristics and shape of the LCI in terms of its nature, productivity and supply. This section provides the key findings regarding this issue.

9.4.1 The Dominance of State Channels of Finance

The state is the key initiator, financier and client of formal construction projects and products as a consequence of its dominant role in all economic sectors and social and development plans over the past three decades. Furthermore, the current financial sector plays an insignificant role in financing the operations of the CI owing to administrative, economic, social and cultural reasons (see chapters three, four and seven). This can be seen as a weakness in the LCI in terms of planning and in contributing to economic and social

development. This study argues that such circumstances should be considered and rethought (see table 9.1 and figure 9.1).

9.4.2 Labour

Since the early 1970s the operations of the LCI have relied heavily on foreign workers and companies as a result of the country's limited resources, lack of skilled construction workers, the low capacity and capability of local consultancy and construction firms, and other social and cultural factors (see chapters six, seven and eight). Thus, Libyans occupy higher managerial and professional jobs in the CI (see chapters three, four, seven and eight). Such circumstances have affected (and are affecting) the shape and operations of the LCI. The supply of construction workers is subject to fluctuations over time in terms of numbers, structure and levels of skills owing to political, social and economic circumstances. This causes delays to projects and increases their cost overruns.

It is argued that, in a country such as Libya which has limited human resources, high oil revenues, intensive demand for construction and shortages of skilled and semi-skilled construction workers, and which is surrounded by many populous Arabic and African countries, foreign workers are an inevitable phenomenon in the Libyan labour market. Furthermore, in the coming years, it seems that the operations of the LCI will not be liberated from a reliance on foreign workers. Thus, the shortages of skilled and semi-skilled construction workers and the complete reliance on foreign workers could be considered as a threat to the operations of the LCI, as the SWOT analysis in table 9.1 and figure 9.1 shows. Libya should consider foreign construction workers as the biggest challenge facing the operations of the LCI, since without its foreign workforce the industry could not operate efficiently.

9.4.3 Construction Materials

Libya produces a significant proportion of its construction materials. However, it lacks an efficient manufacturing industry in electrical and sanitary materials and construction equipment, and plant and machinery are imported from international markets (see chapters four and seven). Importing these materials costs the national economy substantial amounts of hard currency. In addition, it causes delays in projects owing to the currently long bureaucratic procedures for obtaining import licenses.

As mentioned previously, the majority of construction materials are based on cement and related products. Cement, steel, sand, aggregate, water, natural block and cement and clay bricks are the most important basic construction materials, and as mentioned, the LCI and its operations can be described as cement-based. Consequently, the following points arise. Firstly, the operations of the LCI are associated with and influenced by cement production and consumption. Therefore, any shortages in cement and steel affect the operations of the industry. Secondly, as mentioned earlier, water, in terms of quantity and quality, is an important issue; and thirdly, the transportation of cement from the public plants on the coastal regions is expensive. Added to this, despite the crucial position of cement in the operations of the LCI, at the time of this study there is a gap between the demand for and supply of cement (the shortage in cement production was around 3 million tons in 2005). Thus, it is necessary to fill the current gaps in the supply of basic construction materials such as cement and steel in order to improve the current operations of the industry (see chapters four and seven).

9.5 Construction Processes and Operations

According to the model of the CI in figure 2.2, and the SWOT analysis in table 9.1 and figure 9.1, there are overall weaknesses in the LCI's processes and operations. This is considered as one of the key factors which form its current shape and operations. This section provides a concise summary of the key findings related to this issue.

9.5.1 Procurement Systems

As elsewhere, the fragmentation of the industry and its processes into design and construction phases is a main characteristic (see table 9.1 and figure 9.1). Four main deficiencies are identified: firstly, designs lack buildability; secondly, contractual documents have faults such as inaccurate estimates of bids and incomplete documents; thirdly, communication and information systems are poor; and fourthly, delays to construction projects and payments to contractors are common (see chapters seven and eight). Key conclusions and recommendations to improve procurement systems are given in chapter ten.

9.6 Construction Services and Mechanisms

This section provides and discusses the key findings concerning construction services and mechanisms (see figure 2.2, table 9.1 and figure 9.1).

9.6.1 Management of the Industry

This study has shown that the LCI is led by relatively well educated (university graduates) and experienced managers, However, despite training in construction having received considerable concern from the state and public companies over the past two decades, a lack of skilled and semi-skilled workers, managers and experts is one of the weaknesses of the LCI (see chapter six, table 9-1 and figure 9-1). As mentioned, the operations of the industry still rely heavily upon foreign workers. Added to this, a lack of efficient management of the industry and its firms and projects is, in part, responsible for the poor operations and image of the industry. Despite the fact that majority of firms in the LCI are small, fragmentation in terms of planning, processes and operations, is one of the weaknesses of the management of the LCI, as elsewhere.

Furthermore, the industry is still organized according to traditional management styles, construction procurement systems, and within the principles, culture and attitudes of the public economy at the industry, firm and project levels (see 7.3). Moreover, unstable administration and institutions, unclear management systems, administrative corruption and nepotism are some of the main characteristics of management patterns at the time of this study. Moreover, the LCI lacks efficient practices of construction and project management in both the public and private sectors. Firms also lack efficient management patterns and clearly planned management strategy (see chapters seven and eight).

9.6.2 Construction Technology

Concrete technology is popular among Libyans, yet the reliance of the operations of the LCI on cement and concrete technology is seen as a deficiency and weakness in planning in the construction market and the industry's operations, as considered in the SWOT analysis (see 4.6.4, 7.4.2, 8.2, table 9.1 and figure 9.1.). Thus, the LCI will probably continue to be based on labour-intensive methods. Key conclusions and recommendations related to this issue are given in chapter ten.

9.6.3 Weaknesses in Communication and Information Systems

There are overall weaknesses in communications and information systems and methods in the LCI. Present systems are based on paper and verbal formats and traditional formal and informal channels which are characterized by low quality and slow flows of information (see 7.3.2, 7.4.2, table 9.1 and figure 9.1). In brief, it is argued that the

implementation of information technology and wireless communications systems and methods and efficient construction and project management would improve efficiency and make the industry more attractive for Libyan youths.

9.6.4 Supply Systems

Little attention has been paid to the issue of the organization and management of the supply of construction resources, services and products in the LCI. Thus, many constraints impeding the operations of the LCI are associated with the ways in which construction resources, services and materials are produced, organized and supplied. For example, cement and steel are still produced, priced and distributed by the state and its public companies. In addition, financial resources are dominated by the state and there is no clear supply system for land, construction materials, labour and other services (see chapters four, seven and eight).

There are several overall strengths and weaknesses in the current features and resources of firms in the LCI, and the strengths are reflected in the large number of small firms (see table 9.1 and figure 9.1). Today, small firms have a significant role in social and economic development. In addition, the subcontractor system is also a strength in the LCI (see chapter two). However, there is a shortage of specialist firms and large firms in the LCI. Despite the increase in the number of local firms, foreign firms still have a significant role to play in the Libyan construction market, particularly in civil construction projects. Furthermore, owing to geographical, social, political and economic factors informal firms occupy an important place in the LCI in terms of organization and operations.

9.7 The Future of the Construction Industry

There will be a growing need for the CI in Libya owing, in part, to the increase in construction activities in terms of size and scale in future decades as a consequence of the rapid social and economic development of the country. Intensive demand for new construction and maintenance works will put pressure upon the LCI, especially in urban areas (see chapters three and eight). Furthermore, the need for small construction work such as repair and maintenance is expected to increase considerably. Therefore, close attention should be paid to preparing the industry to be able to cope with these demands and future changes in the social, economic and technological context. Generally, as mentioned above, those factors which limit the operations of the CI should be tackled.

However, owing to the current low capacity and capability of consultancy and construction firms, relying on the local construction industry in terms of planning, design, production and construction services is unlikely to be sufficient for some time yet. This should be taken into consideration when formulating development and construction strategies. However, encouraging local firms to become involved in partnering and joint-venture agreements is strongly recommended. A set of recommendations are suggested in chapter ten concerning this issue

9.8 Obstacles and Barriers Identified

As Turin (1978, p.45) argues, the CI can play a vital role in the social and economic development of developing nations, if technological, administrative, financial and legal hindrances and obstacles are managed efficiently. Owing, in part, to the unstable operating environment (see chapters three, four and eight), three broad types of obstacles restrict the operations of the LCI. These relate to the operating environment, firms, and clients and projects. Thus, it is concluded that the LCI operates in an unpleasant environment (see table 9.1 and figure 9.1).

Lessons from countries such as China (a socialist country) demonstrate that readjusting the structure of the CI and changing its role in the economy has enabled the country to achieve rapid economic growth since the beginning of the 1980s (Luo et al 2000, p. 57 and Chen, 1997, p. 5). In Egypt, in the second half of the 1970s, the government adopted an open door policy and reformed the CI. As a consequence, the share of the private sector in construction investment and operation has increased (Selim, 1985, p.29). So the opportunity to rethink, reform the shape and develop the operations of LCI and its role in economic growth and development processes does exist.

In the following chapter, the key conclusions, recommendations and further work are presented.

Chapter Ten

10 Conclusions, Recommendations and Further Work

The preceding chapters have reviewed the main findings of this study. Conclusions for all chapters have made throughout this thesis. The main aim of this chapter is to provide the key conclusions, recommendations, and implications and to report on the main limitation constraining the research. Finally, suggestions for future research are made.

For the purpose of clarity the conclusions and recommendations of this study are presented in three main sections. The first summarises policy conclusions and recommendations. Section two then presents the practical implications of the findings and recommendations; and section three suggests areas for future research.

10.1 Summary

Throughout the discussion and analysis in this thesis, the key aim has been to gain a better understanding of the general characteristics of the LCI and its operations, and to identify those major obstacles constraining its operations.

Chapter two reviewed and synthesized information about the CI and its key issues. The outcome of this chapter was employed to create the operational definition of the CI used in this study, and the body of knowledge regarding the CI. These allowed the model for the LCI to be built (see 2.9 and figure 2.2), and the methodology and the empirical study to be designed. Furthermore, arguments, findings and conclusions in all chapters of this thesis are backed up by ideas and concepts presented in this chapter.

Chapter three explored Libya as the place where the LCI operates. It commenced by exploring the geographical, political, social, historical and economic environments and investigating the relationships between factors and the operations of the CI. Chapter four reviewed and explored the organizational and technological development in the CI in Libya. The outcome of these two chapters allowed the key external factors affecting the LCI and its associated processes and operations to be addressed. Furthermore, the key issues and gaps in knowledge of the industry's organization, processes and operations were identified and considered as key aspects to be investigated in the empirical study in this research.

The above three chapters enabled the theoretical foundations of the study to be established. Therefore, the research methodology and the empirical study were developed and designed in chapter five. Furthermore, the analytical strategy and the statistical tests adopted in this study were explained in this chapter and described in more detail in appendix C.

Chapters six, seven, eight and nine reported on and discussed the findings of the empirical study. The key characteristics and issues of the clients, consultants, contractors, firms and projects were addressed (chapters six and seven). Furthermore, the key major obstacles constraining the operations of the LCI were identified and examined. Added to this, the perceptions of contractors, consultants and clients concerning the general characteristics of the LCI were explored. The future visions of the LC s of growth in the size and scale of construction activities in the coming years was predicted (chapter eight). Finally, the key findings are summarized and discussed in chapter nine. Thus, this chapter provides the key conclusions and recommendations.

10.2 The Key Conclusions and Recommendations

Since there are no prior key studies of the CI in Libya, several problems, issues, questions, findings, considerations and conclusions emerged throughout the different phases of this study. These give indications of the overall strengths and weaknesses of the LCI, as well as the opportunities and threats to the industry (see table 9.1 and figure 9.1: SWOT, analysis). For the purpose of reviewing and clarifying the relevant conclusions within a framework relevant to the research questions and objectives, and to the key main issues of the proposed model of the LCI (see figure 2.2), the conclusions and recommendations are presented under the following main headings: restrictions and regulations, construction resources; construction services and mechanisms, construction processes; obstacles and barriers; the future of the industry, practical implication; future research; limitations of the study; and generalization of the study's findings.

10.2.1 Restrictions and Regulations

Since Libya was gained its political independence at the beginning of the 1950s, politicians and planners have been considered the CI as a key means to achieve social and economic aspirations in Libya (as in other countries). However, the LCI is associated with two particular negative points. Firstly, the industry lacks a clear and wide theoretical

definition and background; and secondly, little effort has been made to understand the external and internal factors affecting the industry's shape and operations, or to address those obstacles constraining its processes and operations. According to the SWOT analysis in table 9.1 and figure 9.1, such circumstances are regarded as weaknesses in the LCI. However, the opportunity to develop the operations of the industry does exist because the industry also has strengths which lie in the characteristics of its consultants, clients and contractors who are mainly educated and experienced in construction, and because demand for construction will increase in the coming decades. Thus, the opportunity to develop the LCI does exist. However, more effort needs to be made to revise and modify policies and laws, particularly those relevant to the involvement of individuals and the private sector in investment in the CI. In addition, efforts should also be made by politicians, planners, researchers, academics, and others concerned with the industry to strengthen the theoretical background and perceptions of the CI among Libyans.

The current shape of the LCI has been formed by Libya's geographical, social, historical, political, economic, institutional and technical context over the past recent decades. Political ideology has been employed in the CI as a means to create equity among Libyans in terms of giving them chances to participate in construction business by adopting partnership principles for organizing the industry and by prohibiting the exploitation of Libyan employees by contractors. Despite the strong commitment of the state to regulate the CI in accordance with formal construction standards, informality is one of the key features of its operations. The informal sector has a key role in production processes and the supply of construction materials and labour. Therefore, owing to its significant role and influence on economy and society, as well as on the operations, production and quality of construction products, future research concerning the informal construction sector in Libya is strongly recommended. However, the CI in Libya operates in difficult geographical, social and economic circumstances (see chapters three, seven and eight). Therefore, it is argued that there are opportunities to manage and reduce the impact of these factors on the CI's operations. Four recommendations are suggested:

1. Policy makers and planners should take into consideration the specific geographical and climatic features of arid lands when formulating construction plans and social and development strategies.

2. Improving communication processes and utilizing information technology (IT) and wireless communications in the LCI would likely provide a practical and economic solution to the problem of geographical dispersion. However, this issue requires further technical, economic, social and environmental assessment.
3. More effort needs to be made to improve the management of limited national resources such as water and agricultural land. Improving the environmental performance of construction technology, equipment and plant is strongly suggested. Therefore, encouraging innovation and investment in dry construction materials, technology and methods are recommended, not only in Libya but in all arid and semi-arid countries. In addition, it is necessary to revise and simplify design and construction codes, specifications and regulations so as to meet regional and local circumstances.
4. Decentralization should be adopted in the management and control of construction resources and activities. It is suggested that more responsibility should be given to local authorities. This would allow the local construction industry to be organized and managed in such a way as to fit their geographical, social, economic and technical circumstances within national standards for construction. However, this shift should be associated with the training of local decision makers, staff and operators of the CI (see 9.9).

The operations of the LCI have been based on a pool of foreign workers. Furthermore, social and tribal relationships and nepotism strongly influence the operations of the industry. Therefore, the study has reached the conclusion that the tribe and the family are key social and economic units in Libyan society which cannot be ignored in terms of organization and the operations of the LCI. In economic terms, business in construction cannot be isolated from social and tribal relationships in Libya. . Therefore, two key points are recommended. Firstly, the tribal system should be taken into account when investigating the CI in Libya, and in formulating construction plans and selecting construction sites and contractors; and secondly, more effort needs to be made to resist and eliminate the negative influences of tribalism and nepotism on the operations of the LCI.

There is a strong relationship between the share of the CI in the Libyan economy and the value of oil revenues. According to the SWOT analysis in table 9.1 and figure 9.1, it can be said that the complete reliance of the CI in terms of investment and operations on oil revenues is one of the threats to its operations and its future. Firstly, oil will one day dry up; secondly, the operations of the industry are subject to fluctuations in line with oil

production and prices in the international markets. Thus, the LCI should be prepared to cope with this critical change in Libya's future economic environment. In the short-term, encouraging the private sector and foreign investment in construction is an alternative. However, the issue should be considered and addressed in more detail by those concerned with Libya's economic and development issues.

It is concluded that the LCI has not been given the opportunity to operate efficiently, grow, develop and play a significant leading role in economic and development processes. This leads to the conclusion that, at the time of the study, the LCI lacks an enabling operating environment. Thus, great effort needs to be directed towards eliminating the impact of and the threat of instability. Stabilising the legal and institutional environment is the first necessary step in creating an enabling operating environment. This includes assessing and reforming the current legal and institutional framework, and eliminating the major obstacles constraining the operations of the LCI. However, it should be understood that building an enabling operating environment is a long and dynamic process which also requires changes in the minds and attitudes of decision makers and the staff and operators of the CI, as well as in the organization, structure and management styles of the CI. Consequently, any action in this regard should be taken by the state with great care to maintain a stable economic operating environment, and to increase certainty and trust in construction business. Furthermore, more consideration should be given to managing any side effects of the processes of readjustment of the industry's operating environment. On the other hand, planners should consider the influences of the external factors and take organizational actions which enable the LCI to response efficiently to these changes.

To rethink and reform the current shape of the LCI's organization and structure to be able to cope with future national construction needs and requirements, the following recommendations are suggested. Firstly, consideration should be given to reducing, where possible the intervention of the state and the influence of political ideology on the organization, ownership and financing strategy of the CI. Secondly, the existing partnership system in the LCI should be rethought. Rethinking partnering should coincide with more effort to create an enabling operating environment to encourage small firms to grow. This may require new definitions of partnership in the LCI. In this regard, it is suggested that an efficient and flexible partnership system will enable small firms to grow

and form larger firms by partnering in capital, experience and operations. It is believed that this will improve the capacity and capability of the LCI in terms of output.

However, it should be taken into account that partnering processes require a stable operating environment, a strong commitment among individuals and firms to achieve joint goals, and effective communication, information and management systems Therefore, great care needs to be taken in creating a suitable legal, administrative, financial, economic, cultural and operational environment which would enable such a partnering system to work in practice. Thirdly, more coordination and integration between the CI's sectors are required in terms of planning and management. In addition, in the long term, engineering educational systems should be revised to allow the CI to be learned about as an integrated process. Finally, it is also argued that tribal organization should be utilized to strengthen construction business and operations. Family firms should be encouraged and supported to work in competitive environments.

10.2.2 Construction Resources

The operations of the LCI have relied heavily on the state's development policies, budgets and levels of spending on construction. In turn, the private sector has a marginal role in the operations of the CI in terms of the financing of major projects and operations. Thus, it can be said that the LCI is a responsive industry rather than an initiating and innovative industry. Thus, the key recommendations in this regard are to encourage the contribution of the private sector in funding building and infrastructure projects, and enabling small firms and clients to have access to construction subsidies programmes and financial services. As mentioned previously, it is argued that it is necessary to reduce, where possible, the intensive intervention of the state in construction in terms of ownership and finance and the dominance of the state over the financial sector. In addition, improving coordination and collaboration between the CI and the financial sector is also required.

Furthermore, currently, the Libyan construction industry's operations are cement and concrete based (see table 9.1 and figure 9.1). Therefore, this study considers water as an important limited and valuable construction resource in Libya and other arid and semi-arid countries. Selection of construction materials, technology, operations and production processes should be based on a greater awareness of the significant position of water in these regions. Therefore, it is recommended that more attention needs to be paid to the

issue of the management of water in construction. Dry construction materials, methods and associated technology should be considered, innovated and developed. As mentioned earlier, this issue requires a specific and in-depth investigation.

To reduce the impact of construction materials on the current operations of the LCI, the following actions are suggested:

1. Libya should concentrate more on developing the manufacture of clay bricks, electrical and sanitary fittings and other imported construction materials. This will free the CI from its current reliance on imports and reduce the consumption of cement. Given the country's large area, establishing small firms and manufacturers for producing construction materials and components at regional and local levels is recommended. However, more attention should be paid to the issue of water and energy when considering this recommendation.
2. As recommended before, research and development efforts must be directed towards developing and innovating dry construction materials which are appropriate to Libya's fragile and harsh environment.

The CI has an insignificant role in the employment of Libyans. Generally, it can be said that the industry is managed by Libyans and operated by foreign workers. Informal workers have a key role in the production and operations of the LCI. Thus, more effort needs to be made to manage the supply of foreign workers, taking into account their skills, experience and technical capability. On the other hand, investment in human resources and improved training and education programmes are strongly recommended.

10.2.3 Construction Services and Mechanisms

There are overall weaknesses in the construction services and mechanisms of the LCI, these have affected (and are affecting) the operations of the LCI (see table 9.1 and figure 9.1). It is concluded that management is the most scarce construction resource in the LCI, as in most developing countries, and this is one of the main weaknesses of the industry, causing delays to projects and increasing their cost overruns. Therefore, it is necessary to improve management capability and the efficiency of the industry to be able to manage future national construction demand as well as the business, social, economic and technological changes, challenges and threats. The following are key recommendations in this regard:

A. Developing the Management Capability and Performance of the Industry

The first step in this direction is to establish an organization or council in charge of the LCI in terms of construction strategies, plans, regulations, supervision, monitoring and development. The main goals and responsibilities of this organization are discussed later in this chapter as one of the implications of the findings of this study. As suggested previously, in order to improve the management capability of the LCI, the state should consider that the key challenge is to stabilize the industry's operating environment, and to readjust and develop management systems in Libyan administration.

Several recommendations can be made in this regard. Firstly, as mentioned previously, more care should be given to education and training in construction. This includes adjusting educational and training programmes to be more focused on the organization and management of people in the CI and of practical and operational aspects. Secondly, management should move towards the application of information technology in the CI. Thirdly, owing to the recent changes in the Libyan economy towards an open market economy, the management approach in the LCI should move from the principles of the public sector of the 1980s and 1990s towards a new open market approach. Changing the attitudes of the staff of the CI and others involved in the operations of the CI should go in line with changes and reforms in regulations and institutions as suggested before. Fourthly, filling the current gaps in knowledge, and remedying the unclear understanding of the CI and the acute shortages of highly educated experts, managers, and designers, and skilled and semi-skilled workers in the CI will help to develop the management capability of the LCI. Finally, as mentioned previously, management strategy in the LCI should pay close attention to the efficient management of Libya's limited natural resources such as water and agricultural land.

B. Improved Construction and Project Management

In order to improve management patterns in the LCI, more theoretical and practical attention should be paid to enhancing the processes of planning and delivery of formal and informal projects. This includes applying new techniques and tools in construction and project management; applying more flexible procurement systems, improving the constructability and buildability of design and contractual documents, better and modern information and communication systems, and reviewing and revising the laws and regulations which restrict the application of modern project management techniques and

programmes. Given that one of the weaknesses is the poor management of construction projects, it is necessary to show a strong commitment towards training and education in construction and project management.

C. Investment in Human Resources and Improved Training and Education Programmes

The problems of human resources in the LCI have three main features. Firstly, Libya has limited human resources in terms of quantity and quality. Secondly, as mentioned previously, construction is not a desirable field for Libyans; and thirdly, the problem with training is not so much a lack of well-equipped training centres, but more the unwillingness of Libyans to be trained and employed in construction. In this sense, the first question to be answered is how to make the CI an attractive occupation for Libyans. Strategies in this regard include increasing investment in human resources and training in construction; and changing the perception of the LCI as a marginal sector with the associated poor image and bad reputation. This requires general improvements in the working and economic conditions of the CI.

As mentioned previously, despite training in construction having received considerable attention from the state and public companies over the past two decades, Libya has failed both to increase the number of skilled and semi-skilled workers in the LCI and to persuade Libyans to work in construction. The inappropriate training programmes and the state policies in the 1980s and 1990s are, in part, responsible for this phenomenon. However, there is now a strong commitment from the state and firms to train in construction, reflected in several plans concerning future education and training. This may help in improving the management and efficiency of the staff in the CI. However, training programmes should be revised and developed to suit the current circumstances of the CI.

To increase human capital in the LCI in terms of quantity and quality, it is necessary to revise and readjust employment laws, regulations and policies which restrict Libyans from involvement in construction. Also, training programmes should target decision makers, managers, contractors, subcontractors and others involved in the planning, management and operations of the LCI at national and local levels. Furthermore, owing to knowledge and skills shortages in the LCI, it is argued that training issues should be investigated and assessed in further research. In the long-term, it is believed that establishing schools for training in the CI at both local and national levels for higher

training and post-graduate qualification is one of the alternatives which should be studied and evaluated.

D. Construction Materials and Technology

Cement and concrete technology determines, in part, the nature of the operations of the LCI and the characteristics of its final products. Therefore, there is a long-term need to diversify construction and technology resources to free the operations of the LCI from their complete dependency on cement and concrete technology. Three suggestions may be made. Firstly, the industry should use more steel structures, particularly for public, industrial and agricultural buildings (Libya has a huge steel mill in Misurata). Secondly, the local construction industry in rural areas should be encouraged to use domestic construction materials such as natural stone and stabilised earth. Thirdly, the use of clay bricks and natural stone should be promoted; and fourthly, new construction materials and technologies should be introduced to the Libyan construction market. Many other materials can be suggested, assessed and tested by technical, social, environmental and economic experts. The application of such recommendations will reduce the relative consumption of cement used in the industry's production and operations processes.

E. Communications, Information and Supply Systems

There are overall weaknesses in communications and information systems and methods in the LCI (see table 9.1 and figure 9.1). Four key recommendations should be made to improve this situation. Firstly, the integration between design and construction processes should be increased as well as the cooperation and collaboration among all parties involved in the industry's processes and operations. Secondly, considering the problem of geographical dispersion, it is suggested that information technology and wireless communication systems should be applied in the operations of the LCI. Thus, more effort should be made to improve national communications and information systems. Thirdly, as mentioned earlier, the impact of tribalism and administrative corruption on communication and information systems should be eliminated; and finally, the efficiency of briefing and design processes and contractual documents should be improved.

Fragmentation, instability, informality and irregularity are the four most important features of supply system in the LCI. Furthermore, it is concluded that the domestic industry still relies heavily upon foreign construction firms, as its current capacity and capability are still unable to meet national construction requirements. It is argued that

developing the ability to rely on local consultancy and construction firms and to free the LCI from its reliance on foreign firms will take a long time.

This study suggests that small firms are an appropriate structure for the CI in Libya owing to geographical, demographic, social, economic and technical factors. In this regard, it is suggested that, according to the lessons gained from the Libyan experience in the public sector over the past three decades, the public construction sector and firms have failed to meet national construction requirements and expectations owing, in, part, to many factors such as inefficient management and the negative impacts of tribalism and administrative corruption. Thus, it is argued that it would be a grave mistake for the state to establish new public companies. Considering this suggestion requires the revision of laws and regulations such as law No. 9 of 1985, law No. 9 of 1992 and law No. 21 of 2001 which regulate the Libyan economy and the establishment of firms in the Libyan market.

To improve the efficiency of supply channels of construction services and products, the following recommendations may be made. Firstly, the managerial, financial and technical capability of local producers and suppliers of construction materials and services should be improved as well as those of consultancy and construction firms. This requires eliminating obstacles constraining their operations, improving management patterns and the working environment, encouraging joint-venture and partnering agreements between foreign enterprises and local firms, along with a focus on training. Secondly, since this study has recognized that, informal construction has a key role in the LCI. Therefore, the role of this sector in the supply of construction products and services should be encouraged; and thirdly, there is a need to reduce the strong control of the state in supplying basic materials such as cement and steel and to fill the gaps between the supply and demand of those two basic materials, particularly during the construction season. As mentioned previously, the private sector should be encouraged to play a more significant role in supplying workforce, land and money for the CI.

10.2.4 Construction Processes and Operations

There are serious overall weaknesses in the current planning and procurement systems in the LCI. Processes and operations are organized around traditional procurement systems. To improve the efficiency of construction processes, more integration between design and construction processes is recommended. Furthermore, flows of information among all parties involved in the CI should be improved. In addition, contractual

regulations and procedures relating to procurement systems, such as law No. 8 of 2004, should be revised in order to enable clients and contractors to adopt more flexible and efficient procurement systems. In general, there is a need to improve constructability and buildability in design and contractual documents. Therefore, it is further recommended that improving briefing, design and estimation processes are necessary steps in eliminating these deficiencies in design and contracting processes. This includes simplifying design and construction codes and regulations, rationalizing contract documents, using information technology and computer-aided programs in design processes and construction management, developing the processes of management decision making, properly planning the duration of tendering and contracting processes, and focusing on training in construction and project management.

Furthermore, as mentioned earlier that in the long term, efforts should be made to encourage consultancy and construction firms to adopt the concepts of partnering in the operations of the LCI. This would enable some of the weaknesses associated with the traditional procurement systems to be overcome. However, it should be borne in mind that partnering procurement systems require improved national communication networks and the training of staff to use information technology, the internet and related services. Moreover, it is recommended that alternative procurement systems, such as design-build, design-build-operate, and others should be introduced to the LCI. However, any shift towards new procurement systems should be planned and based on improving educational and training programmes and enhancing the operating environment. Finally, as mentioned previously, the CI should be learned about and understood as an integration of processes rather than a set of sequential and separate activities. This leads to the conclusion that, in the long term, the educational system should be revised and developed to meet this objective.

10.2.5 Obstacles and Barriers Identified

As long as these obstacles remain without short and long-term strategies to tackle them, the operations of the LCI are unlikely to improve (see chapter eight). Therefore, to overcome and eliminate the influence of these obstacles, and to prepare the LCI to cope with future changes in terms of demand, management and operations, it is recommended that the state should set up a long term strategy to remedy the deficiencies and obstacles identified in this study (see table 9.1 and figure 9.1). Priority should be given to stabilizing the legal, institutional and economic environment and to creating an enabling environment

for the operations of the CI. Secondly, politicians and planners should be aware that tackling the constraints on and obstacles to the CI will be a long and continuous process, requiring removing unnecessary policies, laws and regulations, improving construction procurement systems and management, long-term investment in human resources, utilizing information technology in the CI, developing construction resources and promoting research and development in the CI . In turn, the impact of such procedures on other sectors related to construction should also be taken into account; and finally, researchers, policymakers and all those involved in the management, supervision and operations of the industry should take urgent practical action to tackle and eliminate the influences of these obstacles on the current operations of the industry.

10.2.6 The future of the industry

The future operations of the CI in Libya and its capability to cope with future changes, challenges and threats will be determined by the following key factors. the value of the country's oil revenues; state investment in construction; the commitment to education and training in construction; the participation of the private sector and foreign companies in the construction market; the role of the informal sector in the industry's operations; and the ability of the state to stabilize and create an enabling operating environment. Based on the discussion, the findings of this study and the SWOT analysis (see Table 9.1 and figure 9.1) in the following chapters, it can be said that improving the operations of the LCI requires the following sustaining actions to be considered.

1. Stabilize the industry and its operating environment;
2. Commitment to long-term construction policies;
3. Revise and modify laws and regulations related to the CI and its processes;
4. Link the operations of the CI with the country's fragile environment;
5. Strong commitment to education and training;
6. Increase management capability; and

Prompt research and development; and finally, preparing the industry to be able to response smoothly to threats such dry-up of oil and scarcity and quality of water.

10.3 Practical Implications

Ofori (1994b, p.41) points out that the key aim of research in CI development is to solve the obstacles restricting the industry and to improve its performance. Various courses of actions are possible in implementing the key findings and recommendations of this

study by policy and decision makers and other parties involved in the LCI in order to improve the industry's organization, processes and operations. A set of implications are suggested concerning the operations of the LCI in terms of institutions, research and development, and organization.

1. Establishment of a National Council for the Construction Industry in Libya

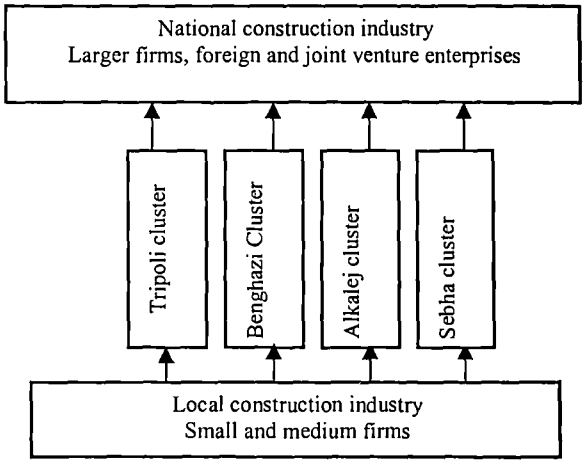
This study shows that there is a growing need for an efficient Libyan construction industry. Therefore, the CI should occupy an important place in the national economy. However, at the time of this study, there was no national authority or organization responsible for planning, administering, monitoring and developing the LCI. Therefore, one of the implications of the findings of this study is that a national organization or council should be established and put in charge of the CI countrywide in terms of plans, policies, administration, mentoring and development. This may be called 'The National Council for the Construction Industry in Libya' (NCCI), and it may open regional branches in the four regions of the country. This organization would take responsibility for collecting, processing, storing and analysing data concerning the LCI and its sub-sectors. It would also be responsible for identifying, monitoring and analysing the operations of and future problems, changes, challenges and threats facing the industry, as well as creating national indicators for measuring overall productivity, performance, capacity and the capability of the LCI, and suggesting plans, strategies and polices for improvement. Furthermore, it may organize collaboration in the national and regional formal and informal construction sectors. Moreover, it should organize conferences about the LCI and carry out short- and long-term research and training courses for managers, consultants, contractors, clients and others involved in the industry.

2. Alternative Organization of the Shape and Operations the LCI

It has been recommended earlier that the LCI's organization should be based on small and medium firms, owing to geographical, demographic, social, economic and technical factors. Therefore, it is recommended that the LCI should be organized on the basis of a cluster structure. This is believed to be capable of meeting Libya's geographical and demographic circumstances as well as future demand, changes and challenges. According to this structure, the LCI would be classified into regional and national levels of the CI. At regional level, the dominant regions in Libya of Tripoli, Benghazi, Alkalej and Sebhah should be considered as the administrative and operational centres for the LCI. In

this sense, small and medium consultancy, construction and services firms in each region would form a regional cluster of the LCI. Each cluster of local firms would be responsible for utilizing regional human and construction resources in order to deliver regional and local construction projects and other construction services.

Figure 10-1: Cluster organization of the Libyan construction industry



As recommended previously, design and construction codes and standards should be simplified in order to fit the geographical, social, economic and technical circumstances within national standards for construction. Furthermore, a decentralized system should be associated with this organization. In addition, the training of local decision makers, staff and operators of the CI is highly recommended. At national level, the LCI would comprise medium and large consultancy, construction and other services firms. Considering the geographical, demographic, social and economic advantages of the Tripoli and Benghazi regions, these would be likely to be concentrated in these two regions. The responsibility of the national construction industry would be to deal with large national, social and economic construction projects. Added to this, in circumstances where projects are large and complicated, foreign and joint venture enterprises can be invited to increase the low capability and efficiency of the national construction industry. Furthermore, local firms can be involved in partnering agreements with foreign companies. As recommended previously, to make this proposal work efficiently in Libya's geographical context, utilizing information technology and wireless communications should be implemented. This would enable the clusters of firms in the four regions to overcome the problems of geographical dispersion. Construction information would flow without delay between firms and other parties. However, this would require efficient wireless infrastructure and

skilled staff. It is believed that these two implications are appropriate for the geographical, demographic social and economic circumstances of Libya. Firstly, it would allow each region to organize its local industry in accordance with its geographical, demographic, social and cultural, and skills and technical circumstances. Secondly, local industry would contribute significantly in developing local society in terms of employment, economic growth and the physical built environment. Thirdly, this would help encourage local manufacturing industries to develop. Fourthly, it would also enable the industry to decrease the current high cost of transportation of construction output across Libya's large area; and fifthly, it would prompt small firms to start-up, survive and grow at regional and local levels.

3. Establishing a Research Centre for Construction in Arid and Semi-Arid Regions

Reducing embodied water in the operations of the CI and its associated operations in Libya, and in other arid and semi-arid countries where suitable land for development is limited and water is a scarce resource, would contribute to preserving limited national resources. This issue is important in arid and semi-arid developing countries such as in Northern Africa, the Middle East, central Asia and China, which face serious challenges in terms of desertification and acute shortages in water resources, excessive exploitation of water, a decline in the groundwater table, climate change and intensive exploitation of non-renewable resources (Banks, 1989; Farooq, S et al. 1981; GPC, 1999, p.5-15; Adeel, 2003, p.219 and many others). Consequently, a research institution for construction in arid and semi-arid regions should be established, with the aim to carry out detailed research, development and innovation in the issues relevant to the CI and its associated resources, technology, skills, education and training, processes and operations. This institution could be established at international, regional and national levels. Owing to the importance of this issue and a lack of theoretical and practical experience, at this stage an international research centre for the construction industry in arid and semi-arid regions is suggested.

10.4 Future research

Throughout the discussion and analysis in this study, various issues and topics have emerged which can be suggested as subjects for future research. Four main future research areas can be recommended as follows.

1. Working towards the Use of Low Embodied Water in Operations of the Construction Industry in Arid and Semi-arid regions

It is argued that in countries which suffer from acute shortages in water supplies, the operations of CI should be based on dry construction materials and technology. Thus, this study calls for an in-depth investigation into the issue of water use in the operations of the CI in arid and semi-arid regions. Such an investigation should identify and assess the quantity and cost of water used in construction and explore strategies towards the use of low embodied water in the operations of the CI in arid and semi-arid lands. Libya could be employed as a case study. This research could be conducted at two levels. The topic can be investigated at an international level by international organizations; and also at national level where the research would be carried out by national organizations and researchers. The central aim of this research would be to assess the levels of embodied water in the operations of the cement-based construction in arid and semi-arid countries and the impact of this on their fragile environment. Added to this, recommendations may be suggested to enable embodied water to be rationalized and reduced. Based on the experience gained in this research, it is believed that such research could be based on theoretical and empirical bases, and the research could address key issues, findings and recommendations concerning the management of limited natural resources and the operations the CI in arid and semi-arid countries.

2. The Informal Construction Industry in Libya

The informal construction industry is under-researched and undefined in Libya. Therefore, it is strongly recommended that future research should focus on the informal construction sector in the LCI. The main purpose of this research would be to fill this gap in knowledge, and to identify the general characteristics and contribution of the informal construction sector to the economy and to construction, as well as to assess its relationship with the formal sector. This research would complement that conducted in other developing countries. This research could be organized around a literature review, case studies and survey research. The limitations in sections 5.9 and 9.11 should be considered, but the outcome of such research could produce a new body of knowledge concerning the informal construction industry in Libya, and suggest appropriate strategies to manage the sector and enable it to play its role.

3. Partnership in Libya's Construction Industry

Given that, at the present time, the LCI is organized around partnership principles, this study recommends that the philosophy of the partnering system in construction in Libya and its influence on the operations of the LCI should be investigated. The key aim of this research would be to assess the current partnership system and expand its definition and scope. This may lead to identifying new or more efficient approaches to partnering in construction which meet the requirements and standards of firms and clients in Libya's context and which could help to improve the overall operations of the LCI.

4. Educational and Training Needs in the Construction Industry

Given that the LCI lacks efficient management systems, skilled labour, site managers, and other managers and experts, new approaches for education and training in the LCI could be investigated in future research. The main purpose of such research would be to assess the current trends in educational and training programmes. A secondary purpose would be to suggest long- and short-term policies and programmes in this area. Given the research methodology applied in this study, an empirical approach is recommended in conducting this study. Therefore, a review of the literature on educational and training systems, the experiences of other similar countries, and government statutes, policies, reports and programmes would be the first step in the research process (see 6.5.4). Then, empirical data relevant to the subject should be collected. The research could then suggest new approaches to education and training systems in the CI and associated areas such as architecture, engineering and construction in Libya.

10.5 Limitations of the Study

Generally, research in the CI is not as easy task. This study is no exception. It was reported in section 5.9 that this study has suffered from several limitations, and all possible efforts were made to overcome them and avoid their influence on the processes, findings, conclusions and recommendations of this study. What follows provides a brief outline of these major limitations.

1. Physical Characteristics of the Place of the Study

Because Libya is a large country in terms of area, this study focused on Tripoli city as a context for the LCI. It is believed that the study has demonstrated that Tripoli city was the best geographical location in order to understand the LCI.

2. Social and Cultural Circumstances

The second limitation was related to the social/cultural context of the study. Many respondents did not wish to participate in the empirical study. The researcher overcame this challenge by utilizing work, social and family relationships to encourage individuals to participate in the study. Therefore, it can be argued that without utilizing social and friendship relationships, this study could have been not carried out at all. Added to this, Libyans are very sensitive about providing information about their business, income and turnover. Furthermore, friendship, social and tribal relationships significantly influenced access to data. These circumstances influenced the response rates achieved in this study (see 5.9).

3. Lack of Previous Studies and Data

The absence of any prior theoretical and empirical studies of the LCI and its related sub-sectors was one of the key limitations of this study. Moreover, the data available relevant to the LCI were characterized by fragmentation and contradiction and they were not classified or presented in appropriate formats. In addition, no prior attempts had been made to analyse and interpret the data. Therefore, many difficulties were experienced in gathering data and information relevant to the key issues of the research. In order to overcome this limitation, virtually all data had to be gathered personally by the researcher. However, in general, data relevant to construction activities and the CI in Libya at the time of this study were poor, irregular, and not classified in such a way as serve research efforts. It is often argued that in Libya "it is often necessary to 'play by ear' in order to 'read' the country's economic performance" (www.newnations.com, 2005). Such circumstances influenced the data and information used in this study in terms of certainty and variability.

4. Technical Circumstances

As mentioned in sections 5.8.1, 5.1.2 and 5.9, the majority of roads, streets and buildings are not named or numbered in the city of Tripoli. As a result, the researcher and his colleagues could not contact a considerable number of firms owing to unclear addresses. Also, owing to social, administrative and technical circumstances, it was concluded that it would be difficult to obtain a suitable response rate using postal or email services in Libya. To overcome this limitation, the researcher employed face-to-face methods in administering questionnaires. These limitations influenced the progress of the research, wasted time and influenced the response rate achieved (see chapter five).

5. Time and Financial Circumstances

This research was sponsored by the Libyan government, and time and finances were critical factors. This influenced the scope and the depth of analysis in the study. The study was limited to the formal construction industry and focused on the current status and those key factors which have formed (and are forming) the current shape and operations of the LCI. In addition, a considerable amount of information emerging from this study has been stored for future use owing to the limited time available. However, this material is now available for use in future research. Furthermore, some important issues which emerged throughout the discussion and analysis in this study, such as water and embodied water in the current operations of the LCI and the relationship between construction technology and operations of the CI in Libya and other arid and semi-arid countries, were not fully analyzed. Thus, future investigations are required to explore and examine these key issues.

10.6 Generalization of the Study's Findings

According to Ofori (1989, p112), construction techniques and their associated operations may differ from one region to another owing, in general, to differences in climate, income, skills and accessibility to construction materials. However, in Libya, the CI operates nowadays according to national design and construction codes, specifications and planning regulations in all the country's regions. Added to this, the previous experience of the current researcher and the findings of this study show that throughout Libya the CI is organized around partnership and its operations are based on cement and foreign workers. Furthermore, the empirical study showed that the majority of educated and experienced staff of the CI were concentrated in the main cities such as Tripoli and Benghazi. The above circumstances lead to the suggestion that the regulations, organization and operations of the CI in Libya are similar throughout Libya. Consequently, in general, the findings and recommendations can be applied to the Benghazi, Alkalej and Sebha regions and everywhere in Libya. Thus, there are various possibilities to generalize the research methodology, findings and recommendations of this study in Libya and also in other countries which have similar climatic, social, economic and construction circumstances. However, findings related to the general characteristics of the key clients, consultants and contractors, firms' resources, turnover and workload cannot be generalized owing to the concentrations of construction activities, engineers and firms in the central regions and cities such as Tripoli and Benghazi. Furthermore, in view of the differences in

geographical, climatic, demographic and to a lesser extent social and economic conditions in the four dominant regions in Libya, in a country such as Libya the concept of generalization in terms of the organization and the regulations of the CI must be treated with some caution. Each region has its own specific geographical, climatic, and natural resources. Therefore, more flexibility is needed in generalising design and construction codes and regulations. More consideration should be given to geographical, climatic and demographic circumstances, accessibility to construction resources and the availability of skilled workers and managers in each region when generalizing laws, codes and regulations as well as the findings of studies concerning the CI in Libya and in other large countries in terms of area.

10.7 The Value of the Research and Contribution to Knowledge

It is believed that the findings and conclusions from the different phases of this research have great value and make a significant contribution to knowledge of the CI in Libya in particular and in developing countries in general. Generally, the research has made the following contributions:

1. This work fills gaps in the literature on the LCI concerning how it developed, is organized and operates, who its key actors are, the general characteristics of its firms, projects and operating environment, what factors affect its current status and shape, the major obstacles constraining its operations, and why the LCI is as it is. In addition, it identifies the strengths and weaknesses of, opportunities for and threats to the industry. Thus, it is believed that the thesis adds to the literature a body of knowledge concerning the LCI, and provides lessons gained from its practices and operations as well as raising key questions which require further consideration and investigation.
2. The findings and recommendations of this study provide important guidelines for decision makers and others concerned with the operations of the LCI and development processes in Libya. This will enable the LCI to be more fully understood, so that more efficient decisions can be made. Further, its findings are a solid theoretical and empirical basis upon which to set up national strategies and policies to develop the LCI and improve its operations, performance, capacity, capability and efficiency, which may enable it to cope with future social, economic, managerial and technical changes, challenges and threats.
3. The data and information gathered throughout this study can be utilised in conducting future research. The research strategy and methodology can be employed to conduct

similar research into the CI in other regions in Libya and also in other countries which have similar geographical, social, economic and technological circumstances.

4. This research raises the issue of water in the operations of the CI in Libya and in other arid and semi-arid countries. This is considered as an important issue in construction. Many countries which suffer from water shortages may benefit from this new concept. Thus, this research may open a new area of research concerning the development and innovations of a dry construction industry and the associated technology, equipment, plant and machinery.

5. Furthermore, this work has raised questions about several issues concerning the operations of the CI in arid regions, dry construction industry and technology, the informal construction sector in the LCI, the implications of wireless communications for the operations of the CI in desert regions and many other subjects. It is hoped that this research is a first step which will encourage the research community to carry out in-depth investigations in these areas.

10.8 Author's Final Statements

Having conducted this research, the author's four final key statements are as follows:

1. The desire and opportunity to develop the LCI does exist. However, without a strong commitment to education, training and research in construction, linking the operations of the CI with Libya's fragile environment, creating an enabling operating environment, encouraging the informal construction sector, and in the absence of efficient construction and project management systems, no advances can be made in the operations of the industry.

2. Libya's construction industry should not operate in the same way as in those countries which have renewable water resources. Embodied water in construction should be carefully considered. Thus, cement-based construction operations are not the final solution to the dilemma of producing a physical built environment in Libya or in other arid and semi-arid countries. It is hoped that innovations in dry construction materials and technology can be made.

3. In arid and semi-arid countries, lessons in the management of limited national resources should be learned before action is taken in architecture, engineering and construction.

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12 Appendices

Appendix A: Questionnaires and semi structured interviews

1. Questionnaire for Construction Firms

No.	CO/	0			
Date	...	.....	2004		

University of Newcastle Upon Tyne
Survey of the Libyan Construction Industry

Questionnaire for construction firms

On behalf of your firm/organization, we would like to ask you in this questionnaire a set of questions about your experience in construction in Libya. Your answers are important and will help the researcher to collect data about construction firms, projects and obstacles constraining the processes and operations of the Libyan construction industry. All information you provide will be treated in confidence and will not be recorded under your name.

Name of company.....	Private:...Public...Domestic ...Foreign.....joint venture.....

Section A: Respondent's background

In this section, we would like to ask you a set of questions about your age, experience, qualifications, official position, and reasons of working in construction.

CO.1. Gender?

Male		1
Female		2

CO.2. What is your age?

.....Years

CO.3. What is your educational level? *(tick one answer which applies to you)*

Under primary certificate		1
Under secondary certificate		2
Secondary certificate		3
Diploma		4
Bachelors		5
Masters		6
PhD		7

CO.4. What is your qualification in construction? *(tick one answer which applies to you)*

Professional		1
Technical qualification		2
Experience		3
Not relevant to construction		4
Others, specify.....		5

CO.5. What is the managerial position you occupy in this firm? *(tick one answer which applies to you)*

Owner		1
General manager		2
A member of the administrative committee		3
Director of a division		4
Manager		5
Others, specify.....		

CO.6. How long you have been working in the construction sector?

.....Years

CO.7. How long you have been a member of this company?

.....Years

CO.8. Where did you work before joining this company? *(tick one answer which applies to you)*

Construction firm		1
Government employees public companies		2
Self-employed		3
Consultant firm or office		4
Others, specify.....		5

CO.9. Why do you work in the construction sector? *(tick one answer which applies to you)*

Qualification background		1
Experience background		2
A lack of opportunity to work in public sector		3
High level of profit		4
Family's previous business		5
Others.....		6

Section B: Firm aspects

In this section, we would like to ask you a set of questions about the company's profile, such as the date of establishment, experience, legal status, type of ownership, size of the firm and scope of activities as well as the firm's workload,, annual turnover, and training and management aspects.

CO.10. .Did you establish this company?

Yes		1
No		2

CO.11. When did this company start up?

Year.....

CO.12. Did the company register according to the state's regulations?

Yes		1
No		2

CO.13. What is the legal form of ownership of this company? *(tick one answer which applies to you)*

Public firm *(Stat–owned company)*	1
Domestic partnership firm	2
One-man firm	3
Joint Venture with foreign company	4
Co-operative firm *(Family or small team- owned co-operative)*	5
Foreign firm	6
Private firm	7
Other, specify.....	8

CO 14. What is the main type of business in this firm? *(tick one answer which applies to you)*

General contractor		1
Specialist contactor		2
Contractor & materials producer		3
Contractor & consultation		4
Contractor & services (trade)		5
All of the above business		6

CO.15. .What was the annual turnover of the company during the last three years? (from 1st January to 31st December of each year in L.D)

2001	2002	2003

CO. 16. How many contracts did the company sign in 2003?

Number of projects	

CO.17. How many projects is the company operating now?

Number of projects	

CO.18. How many permanent workers does the firm employ now?

..... employees

CO.19. Has the company run any training courses for its staff over the past three years?

Yes		1
No		2

CO. 20. If yes, what were the subjects of these training courses? *(Tick the most important one)*

Computer		1
Administration		2
Project management		3
Construction technology		4
All the above		5
No courses		6

Section C: Construction Project's aspects

In this section you will be asked a set of questions about your experience in the last five construction projects. So, please answer the following question mentioning up to five projects.

CO.21. What were the value of contracts and the whole value of projects in the last five projects constructed by this company?

Project	Contract value (L.D)	Final Value (L.D)	
P1			1
P2			2
P3			3
P4			4
P5			5

CO.22. Who were the clients of these projects? *(tick one answer that applies for each project)*

Clients	P1	P2	P3	P4	P5
central government					
Local government					
Public companies and establishments					
Private sector					
Others, specify.....					

CO.23. What were the types of these projects? *(tick one answer that applies for each project)*

Type of projects	P1	P2	P3	P4	P5
Residential buildings					
Non-residential buildings					
Infrastructure projects					
Maintenance and repair					
Others, specify.....					

CO.24. What was the main role of your company in these projects? *(tick one answer that applies for each project)*

Role of company	P1	P2	P3	P4	P5
Planning					
Design and Build					
Construction only					
Design, Build and Operate					
Others, specify.....					

CO.25. How did the company obtain information about the project? *(tick the most important source in each project)*

	Source of information	P1	P2	P3	P4	P5
1-	Friends and relatives					
2-	Tender board					
3-	Formal letters					
4-	Newspapers					
5-	Radio and television					
6-	Internet / E-mail					
7-	Direct invitation					
9-	Telephone & Fax					

CO. 26. What was the type of contract in these projects? *(tick one answer that applies for each project)*

	contracting system	P1	P2	p3	p4	p5
1-	Lump Sum Contracts					
2-	Measurement Contracts					
3-	Cost Reimbursement Contracts					
4-	Others, specify.....					

CO.27. What was the construction duration of each project? *(tick one answer that applies for each project)*

	Length of contract	P1	P2	p3	p4	p5
1-	0-6					
2-	7-12					
3-	13-18					
4-	19-24					
5-	More than 24					

CO. 28. What was the main method of estimation that the company use? *(Tick one answer for each project.)*

Methods	P1	P2	P3	P4	P5
Manual method					
Computer-aided systems					
Both					

CO.29. Did the company's estimates meet the actual cost of projects? *(tick one answer that applies for each project)*

		P1	P2	P3	P4	P5
1-	Yes					
2-	No					

CO. 30. Which of these projects did the company finish without any increase in their value? *(tick one answer for each project.)*

		P1	P2	P3	P4	P5
1-	Increase					
2-	Without increase					

CO. 31. Which of these projects did the company finish without any delay?. *(tick one answer for each pro.)*

		P1	P2	p3	p4	p5
1-	Without delay					
2-	With delay					

CO.32. How did the company employ workers in these projects? *(tick one answer for each project.)*

System of employment	P1	P2	P3	P4	P5
Permanent workers					
Casual workers					
Both					

CO. 33. What were the nationalities of workers employed in those projects? *(tick one answer for each project).*

Nationality of workers	P1	P2	P3	P4	P5
Libyan					
Foreign					
Foreign and Libyan					

CO.34. Did the company contract with subcontractors to carry out the whole or part of those projects?

Yes	
No	

CO. 35. Did the company experience any problems in the contract documents of those projects? *(tick one answer).*

	P1	P2	P3	P4	P5
Yes					
No					

CO.36. How did the company communicate with the other parties in those projects? *(tick one answer for each project)*

	Communication	P1	P2	P3	P4	P5
1	Letters					
2	Face to face negotiation					
3	Telephone & Fax					
4	E-mail					
5	Post					
6	All of the above					

CO. 37. Did the company complete those projects within their contractual duration? *(tick one answer for each project)*

	Pr1	Pr2	P3	P4	P5
Yes					
No					

.CO 38. Did the company hire any equipment during implementing those projects? *(tick one answer for each project)*

	P1	Pr2	P3	P4	P5
Yes					
No					

CO.39. From the list below, what was the most important types of construction equipment that the company used in those projects?*(tick one answer* for each project*)*

Most important equipment	P1	Pr2	P3	P4	P5
Central concrete batching plant					
Small mobile concrete mixer					
Cranes or lifting					
Concrete pump					
Manual mixing tools					
Others, specify					

CO. 40. How do you see the future of the Libyan construction industry? *(tick one answer which applies to you)*

Flourishing		1
Slowing down		2
Getting worse		3
Stable in its situation		4
I don't know		5

CO.41. From which sources does the company obtain these construction materials?*(tick all that apply for each source)*

Materials	State factories	Private factories	Private shops	Importation	Black market
Portland cement					
Limestone blocks					
Clay bricks					
Cement bricks					
Steel					
Doors and windows					
Floor tiles					
Ceramic tiles					
Sanitary fittings					
Electrical fittings					
Sand					
Aggregate					
Coating and painting mater					

Section E: General Opinions and Views

In this section, we would like to know your views regarding the major obstacles constraining the operation of construction firms in the Libyan construction industry and your future vision of Libya's construction industry

CO. 42- Please rank what you believe are the major obstacles restricting the operations of construction firms in the Libyan construction industry from the obstacles listed below?*(Rank the obstacles* 1= Very low 2= Low 3= Moderate 4= High 5 = Very High)

	Difficulties	**1**	**2**	**3**	**4**	**5**
1-	Discontinuity of work					
2-	Delay in payments					
3-	Lack of skilled labour					
4-	Irregular supply of construction materials					
5-	Shortage of qualified project managers					
6	Lack of access to bank credit					
7-	Unfair tax regime					
8-	Lack of hard currency					
9-	Unfair competition process					
10-	Inefficient contract conditions					
11	Unclear specifications					
12	Inefficient supervision system					
13	Unstable administration					
14	Unstable laws and regulations					
15	Lack of equipment					
16	Unwilling to co-operate					
17	Lack of efficient subcontractors					
18	Weakness of company managements					
19	Poor attitude of administrators toward contractors					
20	Weather hazards					
21	Incomplete contract documents					
22	Transportation costs					

CO.43. After reading carefully the following statements, indicate how much you agree with each statement? *(tick one answer which corresponds with to your opinion)*

Statements	Strongly agree	agree	undecided	Disagree	strongly Disagree
Clients prefer to contract with foreign contractors rather than Libyans					
Employment in construction is not attractive for Libyan workers					
Contractors were viewed as exploiters and bourgeois over the past two decades					
Tribal and friendship relationships are important in obtaining work					
Consulting sector lacks experience in design and project management					
Construction activities are based on cement and concrete					
Consultants and construction firms get all their payments on time					
During the production process, there is a huge amount of waste materials					
Projects were not completed within planned budgets and contractual duration					
The administrative, economic and legal context restricts the industry's operation					
Local consultants and contractor firms have a good reputation					
Construction activities consume much of water					
Projects are separated into design and construction phases					

CO.44. What would you like to say about the operation of the construction industry in Libya?

2. Questionnaire for Consultancy Firms

No.	En/	0			
Date	...	.....	2004		

University of Newcastle Upon Tyne
Survey of the Libyan Construction Industry

Questionnaire for consultancy firms

On behalf of your firm, we would like to ask you a set of question in this questionnaire about your experience in consultancy and construction in Libya. Your answers are important and will help the researcher to collect data about consultancy and construction firms, projects and those major obstacles constraining processes and operations of the Libyan construction industry. All information you provide will be treated in confidence and will not be recorded under your name.

Name of company.....	Private:...Public... Domestic...Foreign...joint venture...

Section A: Respondent's background

In this section we would like to ask you a set of questions about your age, experience, qualifications, official position, and reasons for working in construction

En.1. Gender?

Male	1
Female	

En.2. What is your age?

.....Years

En.3. What is your educational level? *(tick one answer which applies to you)*

Under primary certificate	1
Under secondary certificate	2
Secondary certificate	3
Diploma	4
Bachelors	5
Masters	6
PhD	7

En.4. What is your qualification in construction? *(tick one answer which applies to you)*

Professional	1
Technical qualification	2
Experience	3
No relevant to construction	

En.5. What is the managerial position you occupy in this firm? *(tick one answer which applies to you)*

Owner		1
General manager		2
A member of the administrative committee		3
Director of a division		4
Manager		5
Others, specify.....		

EN. 6. How long you have been working in the construction sector?

.....Years

EN.7. How long you have been a member of this company?

.....Years

EN.8. Where did you work before joining this company? *(tick one answer which applies to you)*

Construction firm		1
Government employees/public companies		2
Self-employed		3
Consultant firm or office		4
Others, specify.....		

EN.9. Why do you work in the consulting sector? *(tick one answer which applies to you)*

Qualification background		1
Experience background		2
A lack of opportunity to work in public sector		3
High level of profit		4
Family's previous business		5
Others.....		

En.10.Would you tell us, what is your occupation?

Architect		1
Planner		2
Civil engineer and structural engineer		3
Quantity surveyor		4
Services engineers		5
Others, specify.....		

Section B: Firm aspects

In this section, we would like to ask you a set of questions about the company's profile, such as the date of establishment, experience, legal status, type of ownership, size of the firm and scope of activities as well as the firm's workload, annual turnover, and training and management aspects.

EN.11. Did you establish this company?

Yes		1
No		2

EN.12. When did this company start up?

Year.....

EN.13. Did the company register according to the state's regulations?

Yes		1
No		2

EN.17. What is the legal form of ownership? *(tick one answer which applies to you)*

Public firm *(State – owned company)*	1
Public partnership firm	2
One-man firm	3
Joint Venture with foreign company	4
Cooperative firm *(Family or small team- Owned co-operative)*	5
Foreign firm	6
Private firm	7
Other, specify.....	

EN.18. What is the main type of business in this firm? *(tick the most important)*

Planning	1
Architecture	2
Engineering	3
Architecture/engineering	
Supervision	4
Construction management	5
General consultants	
Others; specify.....	

EN.19. What was the annual turnover of the firm in the past three years? (from 1st January to 31st December each year)

2001	2002	2003

EN.20. How many contracts did this firm sign in 2003?

Number of projects	

EN.21. How many projects is the firm operating now?

Number of projects	

EN.22. How many permanent staff does the firm employ now?

.....

EN.23. Has the firm run any training courses for its staff over the past three years?

Yes	1
No	2

EN.24. If yes, what were the subjects of these training courses? *(tick the most important)*

Computing	1
Administration	2
Project management	3
Construction technology	4
All the above	5
No courses	6

Section C : Construction Project s

In this section you will be asked a set of questions about your experience in the last five construction projects. So, please answer the following question mentioning up to five projects.

EN 25-What was the value of contracts of the last five projects?

Contract value L.D (.000)	P1	P2	P3	P4	P5

EN.26. Who were the clients of these projects? *(tick one answer that applies for each project)*

Clients	P1	P2	P3	P4	P5
Central government					
Local government					
Public companies					
Private sector					
Others, specify.....					

EN.27. What were the types of these projects? *(tick one answer that applies for each project)*

	P1	P2	P3	P4	P5
Residential buildings					
Other buildings					
Infrastructure projects					
Maintenance and repair					
Studies					
Others, specify.....					

EN.28. What was the main role of your firm in those projects? *(tick one answer that applies for each project)*

Role	Pr1	Pr2	pr3	pr4	pr5
Planning					
Design					
Project management					
Supervision					
Design & construction					
Consulting studies					

EN.29. How did the company obtain information about projects before contracting? *(tick one answer that applies for each project)*

Source of information	P1	P2	P3	P4	P5
Friends & relatives					
Tender board					
Formal letters					
Newspapers					
Radio and television					
Internet / E-mail					
Direct invitation					
Telephone & Fax					

EN 30. What were the types of contracts in those five projects? *(tick one answer that applies for each project)*

	contracting system	P1	P2	P3	P4	P5
1-	Complete package					
2-	Architectural design					
3-	Structural design					
4-	Supervision					
5-	Management contract					
7-	Others, specify.....					

EN.31. What was the duration of each contract? *(tick one answer that applies for each project)*

	Duration of contract	P1	P2	P3	P4	P5
1-	1-3					
2-	4-6					
3-	7-9					
4-	10-12					
5-	Over 12					

EN.32. Did the company contract with subcontractors to carry out the whole or part of those projects? *(tick one answer for each project)*

	P1	P2	P3	P4	P5
Yes					
No					

EN 33. How did the company communicate with the other parties in these projects? *(tick one answer for each project)*

	Communication	Pr1	Pr2	P3	P4	P5
1	Letters					
2	Face to face negotiation					
3	Telephone & Fax					
4	E-mail					
5	Post					
6	Others, specify.....					

EN.34. Did the client change the design of these projects during the production process?

		Pr1	Pr2	P3	P4	P5
1-	Yes					
2-	No					

EN 35. What were the main causes of these changes? *(tick one answer for each project)*

	Causes	Pr1	Pr2	P3	P4	P5
1	Inappropriate design					
2	Mistakes in drawings					
3	Telephone & Fax					
4	Deficiencies in cost of project					
5	Change the client of the project					
6	Change in the function					
7	Others, specify.....					

S Section E: General Opinions and Views

EN.36: Based on your experience as a consultant, please rate the seriousness of the following obstacles restricting the operations of consultants firms in the Libyan construction industry?*(Rank the obstacles* 1= Very low, 2= Low 3= Moderate, 4= High 5= Very High).

	Obstacles	1	2	3	4	5
1-	Discontinuity of work					
2-	Unclear scope of client's project					
3-	Client changes of mind					
4-	Delay of payment					
5-	Unfair tax regime					
6-	Shortage of specialist professionals					
7-	Separation between design and construction					
8-	Lack of clear specifications					
9-	Inappropriate planning and design regulations					
10-	Unfair competition process					
11-	Unstable administration					
12-	Poor administrators' attitude					
13	Unstable laws and regulation					
14	Lack of efficient local contractors					
15-	Lack of technical equipment					
16	Lack of efficient contract documents					

EN.37: After reading carefully the following statements, indicate how much you agree with each stamen *(tick one answer which corresponds with your opinion)*

Statements	Strongly agree	agree	undecided	Disagree	strongly Disagree
Clients prefer to contract with foreign contractors rather than Libyans					
Employment in construction is not attractive for Libyan workers					
Contractors were viewed as exploiters and bourgeois over the past two decades					
Tribal and friendship relationships are important in obtaining work					
Consulting sector lacks experience in design and project management					
Construction activities are based on cement and concrete					
Consultants and construction firms get all their payments on time					
During the production process, there is a huge amount of waste materials					
Projects were not completed within planned budgets and contractual durations					
The administrative, economic and legal context restricts the industry's operation					
Local consultants and contractor firms have a good reputation					
Construction activities consume a lot of water					
Projects are separated into design and construction phases					

EN.38: How do you see the future for the Libyan construction industry? *(tick one answer apply to you)*

Flourishing		1
Slowing down		2
Getting worse		
Stable in its situation		4
I don't know		5

EN.39. what would you like to say about the operation of the construction industry in Libya?

.....

.....

.....

Thank you for taking the time to answer this questionnaire

3.Questionnaire for Clients of Construction Projects

No.	CL/	0			
date	.....	.....	2004		

University of Newcastle Upon Tyne
Survey of the Libyan Construction Industry
Client's questionnaire

In this questionnaire, we would like to ask you a set of questions about your experience in construction in Libya. Your answers are important and will help the researcher to collect data about the clients of construction projects, consultancy and construction firms, projects and obstacles constraining the processes and operations of the Libyan construction industry. All information you provide will be treated in confidence and will not be recorded under your name.

Section A: Respondent's background

In this section,, we would like to ask you a set of questions about your age, experience and qualifications

L.1. Gander?

Male	1
Female	

CL.2.What is your age?

.....Years

CL.3. What is your educational level? *(tick one answer which applies to you)*

Under primary certificate		1
Under secondary certificate		2
Secondary certificate		3
Diploma		4
Bachelors		5
Masters		6
PhD		7

CL.4.What is your qualification in construction? *(tick one answer which applies to you)*

Professional	1
Technical qualification	2
Experience	3
Not relevant to construction	4

Cl.5.What is the managerial position you occupy in this firm? *(tick one answer which applies to you)*

Owner	1
General manager	2
A member in the administrative committee	3
Director of a division	4
Others, specify.....	5

CL 6. How long have you been working in the construction sector?

.....Years

CL.7.-How long you have been a member of, or worked for this organization?

.....Years

CL.8. Where did you work before joining this company? *(tick one answer which applies to you)*

Construction firm	1
Government employee/public companies	2
Self-employed	3
Consultant firm or office	4
Others, specify.....	5

CL 9. Why do you work in the construction sector? *(tick one answer which applies to you)*

Qualification background	1
Experience background	2
A lack of opportunity to work in public sector	3
High level of profit	4
Family's previous business	5
Others.....	6

Section B: Project's aspects

In this section,, we would like to ask you a set of questions about your last five projects

CL-10. What was the type of your last five projects? *(tick one answer that applies for each project)*

Type of projects	P1	P2	P3	P4	P5	
Residential buildings						1
Non-residential buildings						2
Infrastructure project						3
Maintenance and repair						4
Others, specify.....						5

CL-11. Who did the designer for these projects? *(tick one answer that applies for each project)*

Designers	Pr1	Pr2	P3	P4	P5	
Libyan designers						1
Foreign consultancy firm						2
Others, specify.....						3

CL-12. How did you select the designers of these projects? *(tick one answer that applies for each project)*

Select of designers	P1	P2	P3	P4	P5	
friends recommendations						1
Designers' reputation						2
Competition						3
Direct order						4
The value of the bid						5
All of the above methods						6

CL-13. What was your main role in these projects? *(tick one answer that applies for each project)*

Role of client	P1	P2	P3	P4	P5	
Providing project's brief						1
Selecting the designers						2
Selecting the contractors						3
Determining the procurement method						4
Funding						5
All of the above						6

CL-14.What was the average duration of the design of these projects? *(tick one answer that applies for each project)*

Duration of contract	P1	P2	P3	P4	P5
1-	1-4				
2-	4-6				
3-	7-9				
4-	10-12				
5-	Over 12				

CL-17. How did you pay fees to designers? (tick one answer that applies for each project)

Method of paying fees	Pr1	Pr2	pr3	pr4	pr5	
Lump sum						1
By square metre						2
A percentage of total estimated cost						3
Others, specify.....						4

CL-18.How did you fund these projects?

Fund of project	P1	P2	P3	P4	P5	
Government's budget						2
Personal savings						2
Company's investment						3
Bank loans						4
Family savings						5

CL19. Did you change the design during the production processes?

Yes		1
No		2

CL-20.If yes, what were the key general causes?

Key reasons	P1	P2	P3	P4	P5	
Inappropriate design						1
Ambiguity in drawing						2
Deficiencies in cost of project						3
Lack of materials in accordance with specification						4
Late delivery of imported materials						5
Shortage of technical personnel						6
Unexpected design conditions						7
Change in the client of project						8
Change in the function of the project						9
Others, specify.....						5

Cl 21. Who did the contractor for these projects? *(tick one answer that applies for each project)*

Contractor	P1	P2	P3	P4	P5	
Domestic partnership Libyan firm						1
Foreign firm						2
Public firm						3
Joint-venture firm						4
Built-owners						5
Others, specify.....						6

CL 22. Based on your experience as a client, can you please rank what you believe are the major obstacles constraining practice and performance of clients of construction projects in Libya. (1= Very low influence, 2= Low, 3= Moderate, 4= High and 5 = Very high influence *(Tick one number for each Item)*

No.	Obstacles	1	2	3	4	5
1-	Complex project-approval process					
2-	Poor co-operation during construction process					
3-	Lack of efficient local contractors					
4	Shortage in experienced consultancy firms					
5	High cost of construction					
6-	Uncertain legal environment					
7-	Poor investment environment in construction					
8-	Lack of access to financial sources					
9	Shortage of land for construction					
10	Unstable administration					
11	High disputes with contractors					
12	Delay to projects					
13	High cost overrun					

Section C: General views

In this section, we would like to know your views regarding the major obstacles constraining the operation of construction firms in the Libya construction industry and the future of Libya's construction industry

CL-23. How do you see the future of the Libyan construction industry? *(tick one answer applies to you)*

Flourishing or prosperity		1
Slowdown		2
Getting worse		3
Stable in its situation		4
I don't know		5

CL. 24. After reading carefully the following statements, how much do you agree with each statement? *(tick one answer which corresponds to your opinion)*

Statements	Strongly agree	agree	undecide	Disagree	strongly Disagree
Clients prefer to contract with foreign contractors rather than Libyans					
Employment in construction is not attractive for Libyan workers					
Contractors were viewed as exploiters and bourgeois over the past two decades					
Tribal and friendship relationships are important in obtaining work					
Consulting sector lacks experience in design and project management					
Construction activities are based on cement and concrete					
Consultants and construction firms get all their payments on time					
During the production process, there is a huge amount of waste materials					
Projects are not completed within planned budget and contractual duration					
The administrative, economic and legal context restrict the industry's operation					
Local consultants and contractors firms have a good reputation					
Construction activities consume a lot of water					
Projects are separated into design and construction phases					

CL.24. What else would you like to say about the operation of the construction industry in Libya?

.....

.....

.....

.....

.....

Thank you for taking the time to answer this questionnaire

Questions in Semi-Structured Interviewees

Questions to Decision Makers

Name of the interviewee:..... .....Place of work..... .....
Designation of the interviewee .....Tel.....
1. Would you please define the term 'the construction industry'.
2. What is the key role of the CI in Libya's economy?
3. Could you please explain how the construction and building sector is organized in Libya?
4. Could you please explain what are the strengths and weaknesses of the current operations of the LCI?
5. What is main current role of the state in construction?
6. What are the key principles of partnership in construction in Libya?
7. Why do you think construction is undesirable occupation for Libyans?
8. Could you please explain what are the key factors restricting the operations of the LCI?
7. Why do you think the operations of the LCI rely heavily on foreign workers?
9. Some people have argued that foreign construction firms dominate the operations of the Libyan construction industry. Do you agree with this argument?
Yes ..... No .....
If yes, why?.....
If no, why? .....
10. Please would you indicate the major obstacles hindering the operations of consultancy and construction firms in Libya's construction industry?
11.What would you suggest to eliminate the influence of these obstacles?.....
12. Do you think the current capacity and capability of Libyan consultancy and construction firms is able to meet national construction demand without foreign companies?
Yes ..... No .....
If no, what are the main reasons? .....
13. Do you think the normal duration of the pre-contracting phase of construction projects takes a long time?
Yes ..... No
If yes; why?.....
If no; why?.....
14. Do you think that the construction duration of projects takes a long time?
Yes ..... No
If yes ; why .....
13. Do you think construction projects are completed within a reasonable time?
Yes ..... No .....
If yes; why?.....
If no; why?.....
15. What are the major obstacles constraining construction projects progress in Libya?
16. Why do you think the vast majority of projects are organized around design-bid- construction systems?
Because:.....
17. What are the main causes of delays to projects?.....
18. How do you rate the operations of the Libya's construction industry?.....
19. Why do you think the vast majority of consultancy and construction firms are small in terms of annual turnover, workload and number of employees? .....
20.How do you see the future of the LCI? Flourishing...Slowdown...Getting worse...Stable in its position ....I don't know
Why? .....
21. Would you agree or disagree with the following statements?

statements	Agree	disagree
Clients prefer to contract with foreign contractors rather than Libyans		
Employment in construction is not attractive for Libyan workers		
Contractors were viewed as bourgeois exploiters over the past two decades		
Tribal and friendship relationships are important in obtaining work		
Consulting sector lacks experience in design and project management		
Construction activities are based on cement and concrete		
Consultants and construction firms get all their payments on time		
During production processes, there is a huge amount of waste materials		
Projects are not completed within planned budgets and contractual duration		
The administrative, economic and legal context restricts the industry's operation		
Local consultants and contractor firms have a good reputation		
Construction activities consume a lot of water		
Projects are separated into design and construction phases		

21. Would you like to state any other opinions or views regarding the LCI?
.....

Questions to Site Managers

Name of the interviewee:..... .....Place of work..... .....
Project .....Tel.....
1. Who is the client of this project?.....
2. What is the key role of your company in this project?.....
3. Would you agree with the argument that the operations of the Libya's construction industry are based on cement and its associated products?
Yes ..... No .....
If yes; why?.....
If no; why?.....
4. Would you agree that production and operations processes of the industry consume a lot of water water?
Yes ..... No .....
If yes; why?.....
If no; why?.....
5. Why do you think construction is undesirable for Libyans?.....
6. Do you think the current capacity and capability of Libyan consultancy and construction firms is able to meet national construction demand without foreign companies?
Yes ..... No .....
If no, why .....
7. Do you think the duration of construction projects takes a long time?
Yes ..... No .....
If yes; why;.....
8. Based on your experience, do you think current construction specifications and codes are appropriate to the country's geographical, social and economic context?
Yes ..... No
If yes; why?.....
If no; why?.....

9. Do clients change the designs of construction projects during the production and construction processes?
Yes ..... No.....
If yes, would you please indicate the main reasons?.....
10. Would you please indicate the key difficulties that you experienced with project documents in the last three projects?
11 Do you employ casual or formal construction workers in this project?
Yes ..... No.....
If yes; are you satisfied with their performance?
Yes ..... No.....
If no, why?.....
12. Why do you think the vast majority of building projects are carried out by informal workers and firms?
13. Why do you think the vast majority of projects are organized around design-bid- construction systems?
Because:.....
14. Based on your experience, what are the key causes of delays to construction projects?
15 Why do significant numbers of construction contracts exceed their initial estimates?
16. How do you see the future of the LCI? Flourishing...Slowdown...Getting worse...Stable in its position ....I don't know
Why do you think so? .....
17. Would you like to state any other opinions or views regarding the Libyan construction industry?.....

Questions to Researchers and Academics

Name of the interviewee:..... ....
Institution .....Tel.....
1. Have you conducted any studies about the construction industry in Libya?
Yes ..... No .....
If yes; would you please specify the most important?
If no, why?.....
2. According to your experience, what are the major key issues for the LCI, and do you think they require specific investigation?
3. Would you agree with the argument that the processes and operations of the LCI are based on cement and its associated products?
Yes ..... No .....
If yes; would you please give more explanations?.....
4. Would you agree that production and operations consume too much water?
Yes ..... No .....
If yes; why? .....
If no, why?.....
5. Please would you indicate the major obstacles hindering the operations of the LCI?
6 What would you suggest to eliminate the influences of these obstacles?
7. Do you think the current capacity and capability of Libyan consultancy and construction firms is able to meet national construction demand without foreign companies?
Yes ..... No .....
If no, why?.....
8. Do you agree with the statement that there is a shortage of experts in the construction industry in Libya?

Yes ..... No .....

If yes; why?.....

If no, why?.....

.9.Do you think the duration of construction projects is too long?

Yes ..... No .....

If yes; why?.....

11. Why do you think the vast majority of construction projects are organized around design-bid-construction systems?

12. How do you see the operations of Libya construction industry?

13. How do you see the future of the LCI? Flourishing...Slowdown...Getting worse...Stable in its position ....I don't know

Why do you think so? .....

14 Would you agree or disagree with the following statements?

statements	Agree	disagree
Clients prefer to contract with foreign contractors rather than Libyans		
Employment in construction is not attractive for Libyan workers		
Contractors were viewed as bourgeois exploiters over the past two decades		
Tribal and friendship relationships are important in obtaining work		
Consulting sector lacks experience in design and project management		
Construction activities are based on cement and concrete		
Consultants and construction firms get all their payments on time		
During production processes, there is a huge amount of waste materials		
Projects are not completed within planned budgets and contractual duration		
The administrative, economic and legal context restricts the industry's operation		
Local consultants and contractor firms have a good reputation		
Construction activities consume a lot of water		
Projects are separated into design and construction phases		

21. Would you like to state any other opinions or views regarding the LCI?

.....

Questions to Financiers

Name of the interviewee:..... .....Place of work:..... .....

Designation of the Interviewee .....Tel.....

1 Does this bank/institution offer financial services to the construction industry in Libya and its associated firms and organizations?

If yes, would you please give more explanation?.....

If no; why?.....

2. Is there a high demand for financial loans, credits and other services from the construction industry and associated sub-sectors?

Yes ....No. .....

If yes, would you please specify the main reasons?.....

If no; would you please specify the main reasons?.....

3. Why do you think that the vast majority of consultancy and construction firms are small in terms of annual turnover, workload and number of employees? Would you please give more explanation?.....

4. What would you suggest as urgent actions for improving the financial climate relevant to the construction industry in Libya?

5. Many argue that the construction industry in Libya will flourish in the coming years. Do you agree with this argument?

If you agree, why?.....

If you disagree, why?.....

6. What else would you like to say about the Libyan construction industry?

Questions to Producers of Construction Materials

Name of the interviewee:..... ..... Type of products :..... .....

Position of the Interviewee.....Tel.....

1. What types of construction materials do you produce?

2. Do your products meet demand in the market?

Yes ....No. .....

If no, why?.....

3. When do you think demand for construction materials increases and reaches its peak in the Libyan construction market?

Why?.....

4. Do you think the prices of construction materials are stable in the Libyan construction market?

Yes ....No. .....

If no, according to your experience, what construction materials are subject to shortages or irregular supply?

Why?.....

5. Many argue that the operation of the construction industry in Libya is based on cement and its products. Do you agree with this argument?

Yes ..... No.....

6. Many argue that the construction industry in Libya will flourish in the coming years. Do you agree with this argument?

If you agree, why.....

If you disagree, why.....

7. What else where you like to say about the Libyan construction industry?

Questions to Suppliers of Construction Materials

Name of the interviewee:..... ..... Type of products :..... .....
Place of the interviewee .....Tel.....
1 Please indicate which construction materials you supply to construction firms?
2. Are some of these construction materials subject to shortages? .....
Yes ..... No. .....
If yes, according to your experience, what construction materials are subject to shortages or irregular supply?
3. When do you think demand for construction materials increases in the Libyan construction market?
Why?.....
4. Do you think the prices of construction materials are stable in the Libyan construction market?
Yes ..... No.....
If no, according to you're experience, which construction materials are subject to fluctuates in prices?
Why?.....
5. Many argue that the operation of the construction industry in Libya is based on cement and its products. Do you agree with this argument?
Yes ..... No.....
6. Many argue that the construction industry in Libya will flourish in the coming years. Do you agree with this argument?
If you agree, why.....
If you disagree, why.....
7. What else would you like to say more about the Libyan construction industry?

Questions to Students

Name of the interviewee:..... .....Department :..... .....
University .....Education level .....
1. Would you please define the term 'the construction industry'?
2. What is the key role of the industry in Libya?
3. After you graduate, where would you like to work?
4. Please write what you know about the following:
   A. The Libyan construction Industry
   B. Construction Projects in Libya

Appendix B: The Construction Industry and Housing Supply in Libya.

Throughout the discussion and analysis in this thesis, it appears that urban housing is one of the most important social and economic issues relevant to the CI and its associated activities and operations in Libya. Therefore, this appendix attempts to briefly outline this issue and addresses its influence on and relation to the operation and role of the CI in Libya.

1. Housing in Libya

Housing is an important issue in social and economic development plans in Libya, as in most developing countries. Therefore, it has occupied an important place in the state's development strategies and policies since the country attained its political independence in 1951. According to the National Corporation for Documentation and Information (1995, p. 16), more than seventy seven per cent of physical built environment in Libya was residential buildings. It can be thus interpreted that a significant proportion of construction concern housing and its associated activities. However, the vast majority of these are in urban areas (see 3.5.1 and 3.5.3). The literature on housing shows that there is an interesting relationship between housing conditions and the state of the CI. According to the World Bank (1993, p. 14),

> "Housing supply is affected by the availability of resources such as residential land, infrastructure, and construction materials. It is also affected by the organization of the construction industry, the availability of skilled and productive construction labour, and the degree dependence on imports''.

It can be understood that, in any study concerned with the CI, the issue of housing can not be neglected. This section provides an overview of housing conditions in Libya, with particular focus on their association with the CI

2. Housing Policies and Development in Libya

Since Libya attained its political independence in 1951, a series of housing strategies, construction policies and supply systems have been adopted in order to deal with housing and its construction issues. These concern public housing programmes, slum clearance, the establishment of new towns and cities, subsidies paradigms, housing loan schemes, public housing investment and housing enablement strategy (World, Bank, 1960; Doxiadis, 1964; Ministry of Housing, 1989; Awotona ,1990; Ministry of Housing and Utilities, 1991; Secretariat of Planning, 1996; General Corporation for Housing, 1999, General Council for Planning, 2002; General People's Committee, 2002; General Council for Planning, 2003 and many others). Furthermore, several researchers and government departments have investigated and documented housing in terms of policy; design, planning, and development over the past two decades (see chapter one).

From a review of the above studies and reports, the following points can be summarized as follows:

1. Housing and construction policies in Libya have undergone a series of changes over the past decades.
2. The role of the state and its interventions in housing production and supply has also experienced significant changes and reforms.
3. Owing, in part, to the absence of an efficient domestic construction industry, housing shortages have increased dramatically in the past decade.
4. The capacity of the LCI has not been able to meet national housing construction demand.

Nowadays, according to the Secretary of the General People's Committee (Prime Minster) in Libya, the two most serious challenges facing Libya today are first employment and second lack of houses and residential units (Ghanem, 2005).

In the following three sections, housing and construction policies and housing investment will be briefly reviewed. Particular focus is given to those aspects relevant to the CI and its impact on housing supply. This review enables demand for the construction of new houses to be

understood. In addition, it allows the development of the LCI and its role in housing development to be identified.

2. Housing Construction Policies between 1951 and 1969:

This section reviews construction of housing in Libya between 1951 and 1969 in Libya. In 1960, the World Bank (1960, p.293-296) described housing and construction circumstances in Libya, stating that large shanty towns surrounded the outskirts of the major cities of the country such as Tripoli and Benghazi. In response to these gloomy housing conditions, the government implemented two housing schemes; the Popular Housing Scheme and slum clearances projects in Tripoli and Benghazi. However, the World Bank report indicated that indigenous construction companies could not be relied on to construct housing programmes and recommended inviting foreign building contractors to tender for the construction of large urban housing projects.

In 1964, the first study concerned with housing in Libya was conducted by Doxiadis Association. The study concluded that Libya faced an acute housing shortage. It was found that the vast majority of the total housing stock (around 189,000 dwelling units) was classified as substandard. The study also suggested that 13,700 houses should be constructed every year between 1965 and 1990 in order to absorb the quantitative housing deficit and meet housing needs. Furthermore, the study indicated that only about 20 per cent of construction materials were produced locally and the rest were imported. In addition, housing stock was constructed by local traditional construction materials (Doxiadis, 1964 pp.265, 266, 272). These figures reflected on the one hand housing conditions and on the other hand the situation of the domestic construction industry and its construction resources.

Based on the above considerations, it is clear that in the early years of political independence Libya suffered from two serious development problems relevant to housing and construction. These were the acute shortages in housing and infrastructures, and the lack of an efficient local construction industry. Owing to these circumstance, the CI occupied an important place in social and economic development efforts.

The responses of the governments of the time implied a strong commitment to housing and construction by adopting social and economic planning as a development model for achieving welfare and progress in the country. Therefore, the first national rolling plan (1963-1986) was implemented at the beginning of 1963. The plan's strategy was focused on investments in public housing programmes, construction, infrastructure projects and agriculture. Around 46.9 per cent of the overall investments were devoted to construction and public buildings and infrastructure works (Tripoli Chamber of Commerce and Industry, 1966, p120-122.). Allan (1981, p.102) noted that the most obvious changes in the second half of the 1960s in Libya were increases in housing construction activities and the use of modern building materials. She attributed this to the influence of oil revenues.

From the above considerations it can be said that Libya had no significant housing and construction industry when it achieved its political independence. Consequently, the CI played an important role in changing the gloomy housing conditions in the country, as will be seen in the following sections. In addition, the state's direct intervention in housing and construction was one of the main characteristics of that period.

3. Housing Construction Policies between 1970 and 1985:

Between 1970 and 1985, Libya experienced a housing construction boom owing to the strong political and social commitment of the revolutionary regime to offer a decent and healthy house for every Libyan citizen. A house was seen as a necessary basic need for any individual and family, and in addition this was considered as a national goal (General Council for Planning, 2002, p.1). As a consequence, the state intervened directly in housing provision in terms of management, planning, finance and construction; in other words, the state was the major provider or guarantor in the housing sector (Secretariat of Services Affairs, 2002, p.8). The reasons behind this large involvement of state include the following:

1. The ambition of the revolutionary regime to accelerate social and economic changes.
2. The difficult housing conditions at that time in which the housing backlog was about 185 thousands units.
3. The sudden and dramatic increase in oil revenues, particularly between 1974 and 1980.
4. The intensive social and economic development plans introduced at the beginning of the 1970s.

Therefore, during this period, several building and housing projects were constructed in different regions of the country; most of which were managed as state-sponsored construction projects. Consequently, the National Corporation for Information and Documentation (1995, p.18) indicated that around 38.1 per cent of the building stock in Libya was constructed between 1970 and 1979. For example, nearly twelve per cent of the overall state's investment in development plans was devoted to the housing sector between 1970 and 1981. Added to this, the investment of the private sector in housing activities was about one and a half times the state's investment in the same period (Secretariat of Planning, 1996, p.2). As a result, around 192,000 dwelling units were constructed between 1970 and 1980; 40 per cent of which were managed and produced by the public sector, whereas around 60 per cent were constructed by the private sector through government subsidy programmes such as housing loans scheme and plot lands. In addition, the rate of construction in the housing sector was around 6.7 houses for every one thousand persons, and the annual compound growth in housing units was around 5.6 units (General People's Committee, 2000, p.20).

As a consequence, several public organizations and companies relevant to housing construction activities were founded during that period. For example, the General Housing Establishment was established in 1973; its main goals were to implement housing policies and to supervise the public housing programmes. In addition, ten central public construction companies and more than 24 local public construction companies were instituted between 1970 and 1980 in order to construct and maintain housing units of the public sector and for citizens in municipalities. Moreover, the National Council for Investment was founded in 1979, and the Bank of Real Estate and Saving in 1980 (Ministry of Housing, 1982, p. 24-25). The main goals of both were to increase investment in housing and construction. This reflects the intensive intervention of the state in the housing sector and construction.

Owing in part to the size, scale and variety of construction and housing projects as well as low capacity and the lack of construction experience, the state relied heavily on foreign construction companies. Egyptian, Morocco, Italian, Turkish, Romanian, and Korean companies, among others, came to construct large public housing and infrastructure projects. Consequently, during that period foreign consultants and construction enterprises dominated Libya's construction market, as discussed in chapter four. However, the state did not introduce any clear commitments and objectives to establish and develop a national CI or to encourage the employment of the Libyan workforce in the construction sector (Secretariat of Planning, 1996, p.10).

In order to cope with housing shortage, the state also introduced high residential blocks to the housing environment. A large number of housing projects were planned, designed and constructed as apartment blocks consisting of 4 to 12 flats. Taric-Al-Matar, Al-Nigila neighbourhood, Suc-Atultal Al-Kadeem and Zawiet Al-Dhamain housing projects are the most important examples in Tripoli city (Grifa, 1997). Furthermore, the state introduced new construction technologies such as prefabricated housing systems; and two plants for producing industrialized buildings were established in Tripoli and Benghazi (Ministry of Housing, 1985).

As mentioned in section 3.4.3, during this period the socialist laws regarding housing, property and land rights were implemented in the country. As a result, rental housing was outlawed and renters of houses were encouraged to become owners. As a result, the private sector in housing production and supply declined sharply. The report of the General Council for Planning (2002, p.11) summarised the major features of housing and construction policies of that period as follows:

1. A total reliance on the state in planning, finance, management and construction of housing and other public projects;
2. Widespread gratuitous culture between citizens in order to achieve their housing needs.
3. A large reliance on foreign consultant and construction enterprises in design and construction activities, and
4. The role of the private sector in housing production for rent was severely restricted.

On the whole, to sum this section, it can be said that between 1970 and 1985, the state intervened directly and intensively in the housing and construction sectors. In addition, the construction of housing experienced a boom. However, the design and construction of housing relied heavily on foreign consultancy and construction firms. Moreover, the public sector played an important role in housing and construction and, in turn, the private sector was restricted and prevented from playing any significant role in rental housing production owing, in general, to ideological principles.

4. Housing Conditions and Policies between 1985 and 2004

In 1985, the state reformed its institutional framework. As a result, the Ministry of Housing was abolished. Furthermore the role of the state changed from being a provider of housing to a supporter or an enabler for citizens to build their own homes. The state stopped its direct intervention in housing and construction activities. According to the UNCHS (1996), in the enablement of the housing environment, the state is seen as a supporter rather than a provider in the housing and construction sector and its main role is to formulate a legal and economic environment which enables people and private sector investors to participate in housing production and services.

In Libya, the sudden change in housing and construction policies towards the enabling strategy in 1985 could be attributed, in general, to the following reasons:

1. The economic crisis owing to the failure of oil revenues at the beginning of the 1980s;
2. The government realised that it could not fund all housing and infrastructure projects;
3. The increase of public debt and the budget deficit;
4. The failure of public housing construction programmes to meet national housing goals;
5. The attitudes of citizens towards public housing and their complete reliance on the state to gain houses;
6. Encouragement of citizens, and public and private companies to increase their investment in housing production by creating an appropriate social and economic environment, offering land for building, offering access to building materials, housing loans and credit facilities (Secretariat of Services Affairs, 2002, p.10, General Council for Planning, 2002, p.8).

As a consequence of these changes, the state made intensive progress between 1985 and 1986 in reforming institutions and regulations to enable the housing market to work without its direct intervention and control. Consequently, since then, the construction of housing and its associated activates have relied on the following programmes:
1. Housing loan schemes of commercial banks and the Bank of Real Estate and Savings;
2. Investment by public agencies such as the National Council for Real Estate, the Social Insurance Fund, the Libyan Insurance Company and partnership companies in municipalities;
3. Investments of citizens.
4. The state's programmes for low-income groups (Secretariat of Services Affairs, 2002, p. 9-10).

It obvious that the state's direct expenditure and investment in housing and construction were replaced by housing subsidies programmes, loans, and private and public investments in housing and construction. However, the sudden and unplanned move toward the enabling strategy caused many bottlenecks and serious challenges to housing and the LCI.

The consequence was that the allocations for housing in development plans decreased dramatically, and the annual production of houses also decreased sharply to very low rates. For example, in 1980 around LD 2551 million was spent in the housing sector; however, in 1991,

expenditure was only LD 486 million, i.e. around 20 per cent of the expenditure in 1980. Added to this, the annual expenditure in the housing sector was around 10-12 per cent that in the 1970s. Moreover, in some years in the 1980s and 1990s, it was only around 8 per cent of the total allocation of the transformational budget. Furthermore, the average annual production of housing units decreased from 8551 units between 1988 and 1992 to 3650 units between 1993 and 1996 (Secretariat of Planning, 1996, p.7-9). In addition, the rate of housing for each one thousand people had declined from 6.7 dwelling units during the period 1970 and 1975 to 3.8 between 1981 and 1987 and then to 2.3 between 1993 and 1996 (Secretariat of Planning, 1996, p. 3). As a consequence, the cumulative housing shortage rose from 73,387 dwelling units in 1995 to 134,000 in 1998 and to more than 142,000 in 2000 (Abograra, 2001, p.13-17).

The above figures indicate that during the 1980s and 1990s housing and construction experienced a deep recession. The General Council for Planning (2002, p.11) attributed this, in general, to the following five key reasons:
1. The sudden withdrawal of the state from housing and construction provision;
2. The dramatic decline in housing allocation in development plans;
3. The economic crisis owing, in part, to the failure in oil prices, increase in inflation rate, unstable exchange rates of the LD and the impact of the United Nations sanctions (see chapter three);
5. The lack of an efficient national construction industry; and
6. Inefficient supply systems of financial services and land for the housing sector.
It is clear that, the state therefore lacked the administrative and management capability to create an enabling environment.

To sum up this section, it can be said that the sudden withdrawal of the state from housing and construction provision in 1985 influenced the CI in terms of the scale of construction activities. Construction of houses experienced a period of deep recession after 1985. Housing production declined and housing shortages increased. This indicates that the state should make great efforts to establish a encouraging environment for the housing sector and the construction industry.

5. Housing Needs and Demand

In the past two decades, the issues of national housing needs and housing shortages have received close attention from policy makers, planners and researchers in Libya. Several government departments and organizations have conducted studies in order to estimate future needs for housing units and to determine the scale of housing shortages (Ministry of Housing, 1989; Ministry of Housing and Utilities, 1991; Secretariat of Planning, 1996; General Corporation for Housing, 1998; General People's Committee, 2002; General Planning Council, 2002; Secretariat of Services Affairs, 2002; and many others). All previous studies have concluded that the housing shortage increased sharply during the 1980s and 1990s, and the state should take urgent action to alleviate the social, cultural and economic impacts of this problem.

For example, two recent studies conducted by the General Council for Planning and the Secretariat of Services Affairs demonstrated that there is a serious housing crisis. The second study calculated that the housing shortage is around 165,000 dwelling units, and that national housing needs would be around 492,000 dwelling units between 2002 and 2011. In addition, it suggested that to clear the housing backlog and meet housing needs over the ten years, it would be necessary to construct 49,000 units per a year. Furthermore, the study estimated that around one per cent of the existing housing stock in 1981, i.e., around 4100 dwelling units per year, require maintenance (Secretariat of Services Affairs, 2002, p. 16).

Previously, the study in 2000 of the General People's Committee estimated that 97.8 per cent of demand for housing will be in new units in order to absorb the housing backlog and to meet the demands of population growth, and 2.2 per cent of demand would be for replacement of the existing housing stock. In addition, more than 81 per cent of demand for housing will be in urban areas, with the rest in rural and agricultural areas (General People's Committee, 2000, p.30-31).

In the light of the above considerations, it is clear that the demand for new housing units and maintenance work in the housing sector will increase in coming years. This indicates that intensive demand for construction will face the CI in Libya in the future. However, it seems that the numbers of houses needing to be produced will never be constructed owing, in part, to the financial constraints and the low capability and capacity of the Libyan construction industry.

Appendix C: Data Analysis and Categorization Processes

Introduction

The aim of this appendix is to introduce the analytical strategy employed for managing the quantitative and qualitative data gathered during all phases of the empirical research in this study. It also synthesizes and categorizes the findings of the study into key issues and aspects.. In addition, it forms an analytical framework which guides the process of analyzing and interpreting the findings of the theoretical and empirical studies in this research. Furthermore, researchers can use the analytical strategy and procedures adopted in this study in further research.

1. Characteristics of the Data Gathered

From all of the phases of the theoretical and empirical study in this research, four types of data and information were collected. These are as follows:

1. Secondary resources relevant to the CI and its associated activities and sub-sectors. These include government reports, laws and regulations, files of construction projects, diaries of site managers and the annual reports of companies (see chapters three and four).
2. Statistical and construction data related to the LCI and its construction activities, workforce, consultants and construction firms, construction projects, construction output, share of LCI in GDP and GFCF and many other aspects (see chapter four).
3. Quantitative data based on the questionnaire survey of the LCI administered to contractors, consultants and clients (see chapters five).
4. Qualitative data based on an interview survey (32 semi-structured interviews) with different parties involved in the LCI; and other supportive research activities such as visual and physical surveys, visits to consultancy and construction firms and construction projects, reviews of letters from the correspondence files of projects, and a review of site manager diaries (see chapter five).

The data gathered were coded, processed and analyzed in four main phases. These were: analysis of secondary resources; statistical data analysis (using SPSS and Excel software); secondary data analysis and content analysis of interviews. These will be discussed in detail in the following sections.

2. Characteristics of Responded Questionnaires

To ensure that responses to the questionnaires were in accordance with statistical standards, they were classified manually into four categories from the point of view of missing data, quality and validity. These categories are: responded successfully or useable questionnaires; wrongly classified cases; discarded questionnaires; and cases which could not or who were unwilling to participate in the survey (did not respond).

The term 'responded successfully' means that all questions in the questionnaire were answered completely and precisely. The wrongly classified cases indicate those which did not conform to the questionnaire criteria (some firms were classified and registered as a construction or a consultancy firm but in reality they practiced different businesses). Discarded questionnaires refers to those cases in which there were missing data (between 5 and 10 of the questions were not answered; some firms were reluctant to answer questions relevant to annual turnover) or illogical or frivolous answers (where for example the respondents answered the questionnaires quickly and without serious thought and some firms adjusted their statements of annual of turnover to match their tax declarations). This is possibly owing to lack of confidence, the uncertainty of the environment or unwillingness to give information. Firms could not be contacted owing, in general, to difficulties in obtaining the correct address; or the firm had closed down or had amalgamated with another firm. Not responded classifies those persons who agreed to participate in the survey as a matter of a courtesy, but did not answer the questionnaire.

In the light of the above categorization, it is clear that the unwillingness of respondents to give information, unserious answers, missing data and the inaccessibility some of firms in the representative sample were responsible for discarding a large number of questionnaires. Such a situation was anticipated before conducting the survey owing, in general, to the political, social, cultural and bureaucratic context of the study.

3. Data Analysis Strategy

According to Marshall et.al. (1999, p. 150), "data analysis is the process of bringing order, structure, and interpretation to the mass of collected data. It is a messy, ambiguous, time-consuming, creative and fascinating process". The study is concerned with gathering facts, opinions, views and perceptions of key operatives and many other participants involved in the processes and operations of the LCI, and therefore the central questions of this study are not specific questions based on propositions or hypotheses. Therefore, the data analysis strategy used in this study is guided by the following considerations: the purpose of the study; key questions to be answered; the sampling frame of the study; secondary resources and raw data gathered in the survey; the intention to triangulate results (see chapter five), the response rates achieved from the questionnaires, the quality and validity of data, the possibility to generalize the results emerging from the case study; and the influence of social, political circumstances,. Added to these considerations, the theoretical framework on which the study was based and the available data, time constraints and other limitations of the study determined the scope and depth of the analysis (see chapter one and five)..

Based on the above considerations, the analysis was organized around exploratory methods, in which empirical data and theory was used in order to analyze and interpret the findings of the study. In this sense, different theoretical perspectives and viewpoints proposed by other researchers relevant to the topic were employed in discussing and confirming the findings of the study (Dale, 1988, p.40). Consequently, the analytical framework in this study comprises two main phases. The first phase was based on quantitative data, and in the second phase qualitative data was analyzed. Four sub-phases of analysis were carried out, including: secondary data analysis; the analysis of the questionnaire survey (quantitative data); the analysis of secondary resources; and analysis of the interviews (qualitative data). The following sub-sections will explain each phase and its main objectives, and explain how this strategy enabled the data and information collected to be managed and analyzed efficiently. Figure 1 explains the analytical methods and phases of this study.

3.1. Secondary Data Analysis

Throughout the course of the theoretical and empirical study, great efforts were made by the present researcher during all phases of the research to collect all possible data relevant to the CI in Libya and its associated activities and sub-sectors. In this regard, data about the size and composition of the construction and consultancy sectors and many others were gathered from direct personal contacts. However, as mentioned previously, data relevant to the LCI and construction activities were usually found to be fragmented between different sources, over-general, poor in quality and irregular, and therefore could not give an accurate picture of the industry. Added to this, existing data were not classified to serve research purposes. This phenomenon exists in most developing countries. To overcome these deficiencies, the triangulation of data was adopted in this study (see chapter five).

Therefore, owing to acute shortages of previous studies about the LCI, the secondary data analysis was one of the most important phases of the analytical strategy in this study, by which a series of procedures were applied to the available data and information in relation to the LCI. Consequently, significant numerical facts and indicators were sought about the structure and distribution of the population, the size, type and distribution of construction activities, the contribution of LCI to GDP and GFCF, capacity of the LCI, numbers of foreign construction workers and firms, inflation, basic construction materials and many other indicators relevant to LCI and its clients, firms and environment. These were utilized to describe the LCI and its operating environment and to discuss and interpret the empirical findings of this study. It is clear that the results of the secondary data analysis allowed the historical development, current status and the general characteristics of the LCI to be understood, described and documented. Chapters three and four were based mainly on the findings from this phase.

3.2. Analysis of the Questionnaire Survey

The process of planning and conducting the questionnaire survey was discussed in broad detail in chapter five, and the general approach to analyzing the questionnaires was also explained.

This section attempts to provide a detailed description of the analysis of the questionnaire survey. According to Galyer (2000, p.363), there are two categories of statistical analysis

> "The first category is known as descriptive statistics and the second category is known as inferential statistics. As the name suggests, descriptive statistics describe some thing such as characteristic of the sample. Inferential statistics, as the name suggests, allow us to infer or make some inference about an aspect of the social world. Most social research projects use a mixture of descriptive and inferential statistics".

Figure 1: The analytical methods and phases of the study

Analysis method	**Objectives of analysis**	**Techniques of analysis**
Secondary data analysis - Statistical data - Census	- To re-analyse datasets - To generate numerical facts and impressions - To guide and support arguments and findings	- Excel software
Statistical analysis of questionnaires - Construction firms - Consultancy firms - Clients	- To analyse quantitative data - To generate numerical facts, opinions, perceptions and impressions - To conduct a descriptive and inferential analysis - To raise and organize key issues - To guide and support arguments and findings -	- SPSS (Statistical Package for Social Sciences) and Excel software
Analysis of secondary resources - Previous studies - Government reports - Letters and files	- To analyse qualitative data - To generate facts, opinions, perceptions and impressions - To compare and link data with secondary resources - To raise issues - To establish, guide and support arguments and findings - To describe and document LCI	- A review of secondary resources and extracting relevant information
Analysis of interviews - Decision makers - Academics - Researchers - Producers and suppliers - Site engineers - Financiers - Students	-To analyse qualitative data - To generate opinions, perceptions and impressions - To compare and link data with the findings of the questionnaire survey - To raise issues - To establish, guide and support arguments and findings - To underpin arguments and questionnaire results	- Content analysis
Analysis of supportive research activities - Photographs - Correspondence files - Letters and dairies - Informal comments - Visits to firms - Visits to projects	- To describe and document LCI - To generate numerical facts and impressions - To support arguments and findings - To investigate real life cases	

In this study, it is very important to emphasise that the objective of the statistical analysis is to explore and generate statistical and numerical indicators concerning the research aspects or variables. These enable the general characteristics, key issues, and major obstacles of the industry

to be categorized, described and then statistically analyzed and confirmed. Therefore, owing to the nature of the study (as the first exploratory study in its field), its purposes and the type of questions asked, there is no need to conduct rigorous statistical tests. In this sense, a large part of the statistical analysis in this study was organized around descriptive statistics, but inferential statistics were employed to examine the differences between opinions and views of consultants, contractors and clients using analysis of variance (ANOVA).

Consequently, in general, statistical analysis was employed firstly as a means to create datasets for the LCI. Then, secondary data analysis was conducted by which the survey findings were discussed and interpreted. Therefore, it can be said that the main objective of the statistical analysis in this study was to enable a descriptive analysis of the empirical findings of the questionnaire survey to be made. As a consequence, frequency distributions were used to show "how the respondents are distributed on the variables" (Surfian, 1998, p.146). In addition, cross-tabulations were employed to "examine the relationships between two variables" (Miiler, 2002, p.80). Furthermore, in order to measure the relative effectiveness of the responses, The Weighted Average Score (WAS) and Average Weighted Responses (AWR) were calculated using the following two formulae:

1. The Weighted Average Score of Responses (WAS) $=\sum fx$ $(1 \leq AWR \leq 5)$ where f is the number of respondents, x is the number given by the respondents to each obstacle ranging from 1 to 5.
2. The Average Weighted Responses: (AWR) $=\sum fx / N$ $(1 \leq AWR \leq 5)$ where f is the number of respondents, x is the numerical number given to each factor by the respondents and ranges from one to five, and N is the all the number of response cases.

Furthermore, analysis of variance (ANOVA) at the 5% significance level was undertaken to test the findings and identify whether the key actors' (clients, contractors and consultants) opinions and views regarding some variables and aspects of the LCI were similar. An ANOVA programme is available on SPSS. This test allows the findings of the survey to be tested statistically, clarifies the differences between the mean values of the survey groups and finally, allows conclusions to be addressed. Furthermore, a SWOT analysis (strengths, weaknesses, opportunities and threats) was employed to identify the strengths and weaknesses of, and opportunities for and threats to the LCI at the time of the study.

After the questionnaire survey was carried out, and questionnaires responses were assessed and classified, the quantitative raw data was analyzed. The process of analysis includes two main phases, in the first phase the following procedures were carried out. Firstly, for the purposes of analysis and for comparisons to be made between the responses of consultants, contractors and clients, all responses from the clients, construction firms and consultancy firms were coded. The coding process comprised two steps; each question was given a prefix: (CL) for clients, (CO) for contractors and (EN) for consultants. This process allowed the discussion and analysis of all questions to be clear; in addition it enabled clear linkages to be made between responses in different sections, as can be seen in chapters six, seven and eight. Furthermore, the variables or categories for each question were also coded numerically. Then, the coded answers were edited using SPSS (Statistical Package for Social Science) and Excel software to conduct the secondary data analysis and to calculate the overall all responses and create tables and charts at later phases of the study. The simplicity and capability of these two packages to manage efficiently the raw data, create clear graphs and presentations of the findings of the study were the key reasons underlying employing them.

The output of the above phase was large: three separate reports for contractors, consultants and clients, including numerical frequencies of facts, opinions and perceptions of respondents in numerical and graphical format. This allowed each variable involved in the survey to be statistically described using frequencies, percentages, means, modes, and minimum and maximum values. Moreover, the outcome of the first phase allowed the descriptive analysis to be conducted and a dataset for the LCI and its associated key issues and variables to be created. Then, the second phase

was conducted in which secondary data analysis was carried out. In this phase the results of the first phase of the analysis were described, discussed, commented on, interpreted and finally statistically tested. This discussion was based on the outcome of the first part of this study, the findings of previous studies, the results of the analysis of secondary resources, the secondary data analysis, the results of qualitative research and lessons gained from previous experience of working in Libya over the past two decades.

3.3. Analysis of Secondary Resources

One of the major limitations of this study was a lack of any significant previous studies in the area, and an acute shortage of data, information and knowledge about the development, scope, role, organization and structure of the LCI and its associated processes and operations. To overcome these limitations and to bridge this gap in knowledge, it was decided to rely on secondary resources and administrative records which are relevant to the industry and its related sub-sectors and activities.

As a consequence, a large number of secondary documents were gathered during all phases of the empirical research; these included historical sources, laws and decision relevant to the management, organization, supervision and operational aspects of the CI in Libya, previous studies, government reports, and construction and housing policies, social and economic development plans and programmes, reports of technical committees, government follow-up reports, letters and diaries of site engineers, correspondence files for completed projects, and photographs. All of these were collected from personal contacts, and some photographs were taken by the present researcher (see chapter five).

Documentary analysis was employed as a means to generate indicators and information about the LCI. The selection of documents was based on focusing on those most relevant to the research variables studied. On the other hand, it was observed that photographs are rarely used in research in the CI. Prosser (1998, p.97) argues that "image-based research plays a relatively minor role in qualitative research". However, in a construction industry such as in Libya which does not have a documented history, photographs have a vital role to play, particularly in describing and analyzing its development. In this context, Adelman (1998, p.148) tells us that "the research photograph is a method seeking discovery rather than a technique of documenting instances and object relationships".

Therefore, the main objective of the analysis of the secondary resources was to obtain information about the general characteristics of the LCI in terms of its development, indigenous construction activities, structure and organization, and many other aspects. The process was based on an intensive review and analysis of secondary documents and administrative records. Then, relevant paragraphs were highlighted and extracted and, finally, the emergent themes and subjects were coded and categorized under main and sub-headings. In this process, the following issues were addressed: indigenous construction activities, the development of the LCI, changes in the nature of construction resources, processes and operations, scope of the industry, construction resources, and role of government, as well as construction and housing policies, foreign firms, construction workers, and social and economic development plans.

The outcome of the above analysis enabled, in part, the LCI and its associated development, changes and operations to be described, understood and documented for the first time. As a consequence, a significant part of the descriptive analysis for the LCI and its general characteristics in chapter four was based on the findings and information generated in this phase of the analysis.

3.4. Analysis of Interview Survey

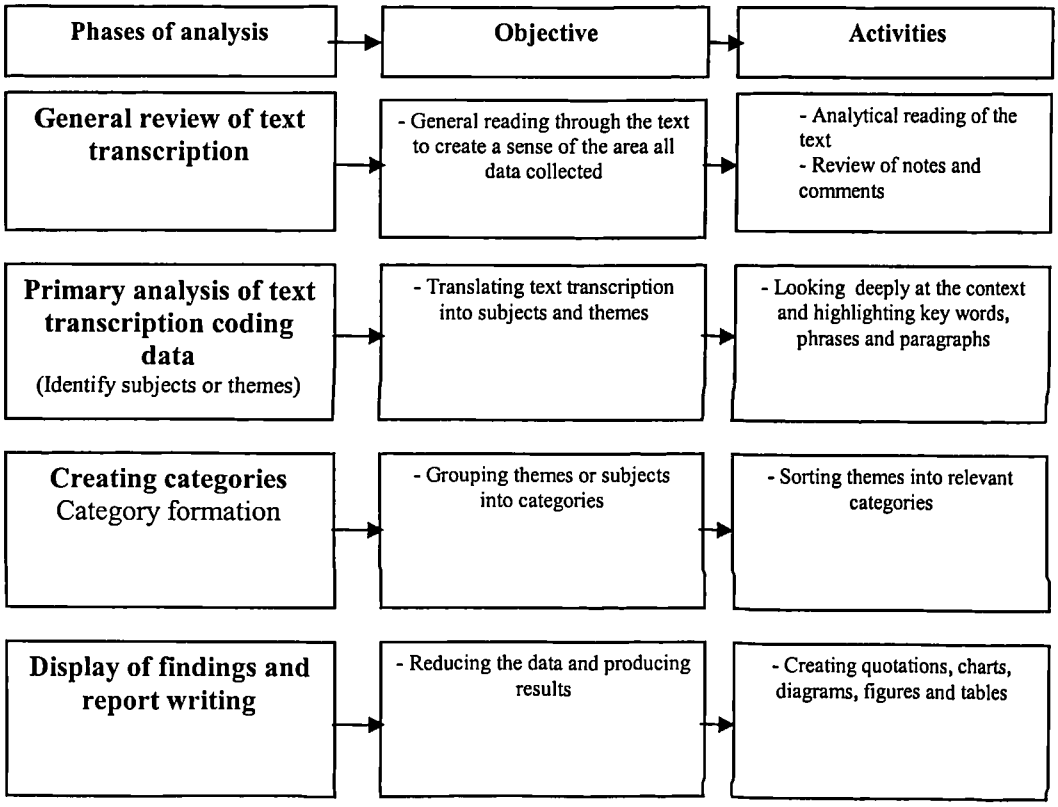
The analysis of this qualitative data was organized around content analysis, which allowed the ideas, opinions, and views of the interviewees to be extracted from the text. According to Roberto (2004, p.550), "one of the most common approaches to content analysis is thematic analysis, where the coding scheme is based on categories designed to capture the dominant themes". Fielding et al (2004, p.530) state that context analysis was one of the earliest approaches to the analysis of texts. Lists of words are important tools in this tradition. One of the most familiar kinds

of word list, the index, shows not only which words appear in a text but also their position . Owing to the intention to interview a significant number of regulators and participants in the CI in Libya, the questions and structure of the interviews differed. As a result, each interview was transcribed and analyzed manually. The analysis of the interviews is described in the following section.

The process of the management and analysis of data collected in the interview survey in this study was based on text transcriptions. As can be seen in table 1.2, an attempt was made to synthesize the views of interviewees through a process of inductive analysis. It was believed that this process enabled salient themes and categories from the text to emerge and be identified. As explained in the table, the process comprises four main steps as follows:

The first step includes preparing a clear text transcription from the replies of the interviewees, and then a comprehensive reading was conducted several times in order to become familiar with the text, and to create general insights about the qualitative information, and to determine the general dimensions of the information. According to Dey (1998, p.83), "the aim of reading through our data is to prepare the ground for analysis. We can compare the actions of reading the data with a bit of gardening. By digging over the ground, we loosen the soil and make it possible for the seeds of our analysis".

Figure 2: Analysis of qualitative data



Source: Adapted from Creswell (1998) and Marshall, and Possman (1999).

2. The second phase is the analysis of the text transcriptions by which the key facts, words, phrases and paragraphs relevant to the enquiry are marked and highlighted in different colours. Moreover, paragraphs to be cited from the transcription are underlined and marked in a specific colour. Finally, relevant paragraphs are extracted and organized in tables under different headings. The main objective of this phase is to summarize the transcriptions, to identify the relevant themes, to

translate and classify interviewee opinions, views and perceptions into subjects and themes and to identify any overlapping themes or hidden meanings

3. The third phase consists of creating coding categories in to which themes or subjects are grouped. The central objective of this phase is to group subjects under a particular title or a heading. In this context, Creswell (1998, p. 144) argues that "category formation represents the heart of qualitative data analysis". Marshall et. al, (1999, p. 154) sees categorization as a consequence of prolonged engagement with the data (the text transcription).

4. The final step of the process is to display and present the findings of the analysis using many techniques, such as quotation, citation, charts, diagrams, tables and figures. The general objective of this phase is to summarize the findings and make them more direct and clear.

The above procedures were employed to handle all of the interview data and information. As a consequence, data and information of varying quality and quantity were generated from the analysis and categorization. However, owing to the nature of the study, the type of research questions and the main purpose of the study, as well as time and financial constraints, it was decided to extract bits of data and information (citations) which are relevant to the key issues of the study from the text transcriptions. These were used as a means to present the results of the interviews, views, opinions and perceptions of interviewees and, finally, they were used to underpin the analysis, argument and discussion.

The findings from the interview survey were categorized under four broad issues or themes. These are:

1. The CI in Libya (definition, scope, development, indigenous resources, processes and operations, policies, organization, regulation, obstacles and future vision, etc.);
2. Construction resources (construction materials, workforce, land, finance and management);
3. Construction and operation processes and procurement methods (subcontractors, role of the informal sector, role of key actors, efficiency of contracts, etc.);
4. Obstacles constraining the industry's operations (delays in payments, delays to projects, unstable economic environment, irregular supply of basic construction materials, lack of experienced workers, etc.). These categories are tabulated and discussed in more detail when introducing the process of categorization in this appendix.

Furthermore, the volume, validity and quality of the information generated enabled suggestions for further research to be made. In this regard, Hakim (1987, p.26) indicated that one of the characteristics of qualitative data is that it allows exploratory studies and more focused quantitative studies to be addressed. In this sense, the qualitative data offered good material for further research.

3.5. Analysis of Other Supportive Research Activities

To collect data and information that could not be obtained by the analysis of secondary resources and formal construction data, or from the questionnaire and interview surveys, several supportive techniques were employed to collect data and information (see chapter five).

Based on the analysis of the collected data and information, a body of information was formed; this included comments and notes based on observations, the physical survey of the built environment, the characteristics of the operating environment and people's attitudes towards construction. In addition, citations were extracted from transcriptions of informal interviews and discussions with traditional builders, workers, informal contractors and many others. Furthermore, dozens of photographs narrated the historical and technological development of the LCI and its associated products and operations in general and in particular in the city of Tripoli. Opinions and views were collected from the review and analysis of two diaries of project site managers and three correspondence files of projects. Furthermore, views and comments were compiled from the comments of workers in five construction firms and two consultancy firms and projects

The results of the above analysis were categorized under four main issues or headings:

1. The historical and technological development of the LCI;
2. Key features of consultancy and construction firms;
3. Barriers and obstacles impeding the operations of the industry; and
4. General opinions and views regarding the LCI and its associated processes and operations. These results were combined with the information from the different phases of analysis in this study.

4. The Outcome of the Analytical Process

The results obtained from secondary resources, secondary data analysis, the questionnaires and interview surveys, cases and other supportive activities were combined. A set of issues were integrated in order to reflect the research aims and objectives. This integration allowed opinions and views, as well as perceptions about the LCI and its key issues, processes and operations to be extracted and coded from the point view of the key actors (clients, consultants and contractors), regulators (policy and decision makers) and other participants (producers and suppliers, project and site managers, academics, researchers, financiers and recently graduated students).

This process enables the general characteristics of the LCI to be described and understood, as well as the discussion, analysis, arguments and conclusions of this study to be formed. Furthermore, the analysis allowed key issues and aspects, as well as major obstacles constraining the LCI and consultants, contractors and clients' perception, to be fully highlighted, identified and analyzed. It is believed that the above analytical strategy and its associated procedures enable all secondary and primary data that were gathered during all phases of the empirical research to be analyzed, discussed and interpreted efficiently. This leads the ongoing discussion to consider the process of categorization of the findings of the study. The following section will discuss this issue.

5. The Process of Categorization

For the purpose of building up the basis for discussion and analysis in this study, it is therefore essential to set up some sort of categorization for the findings of the study. Consequently, the process of the categorization of findings is a crucial phase in the whole research process. It is the framework which guides and organizes the process of discussion, interpretation and analysis of the results, and links the research aims and objectives with the study's findings. Furthermore, it enables the researcher to compare the results of the study, to identify differences and similarities and to make vital links between the results of the quantitative and the qualitative research. Finally, it allows the emergent issues and research variables to be integrated under key issues and indicators.

In this study, the process of categorization depended on the purpose and the research questions of the study. Therefore, the information and findings which emerged were grouped and categorized into two broad sets: quantitative and qualitative issues. These are categorized under two main headings: firstly, issues and aspects based on the findings of the questionnaire survey, and secondly, issues and aspects emerging from the analysis of the interview survey and cases and their associated activities, secondary resources, observations and secondary data analysis.

5.1. Issues and Aspects Emerging from the Qualitative Research

Methodologically, the categorization process was based on the analysis and discussion in chapter five which enabled the researcher to identify the key issues of the research to be investigated. The issues which emerged from the qualitative research are grouped under the issue 'the Libyan Construction Industry: Development and *Organization of the Libyan Construction* Industry'. This includes key aspects and factors that influence the CI in Libya in terms of development, regulation, scope, operations, structure and organization. These aspects were grouped under five main headings: the indigenous construction industry in Libya, changes in processes and operations, the legal and institutional framework, the scope and role of the industry, structure and organization of the LCI and operational aspects. Table 3 illustrates these key aspects.

It was considered vital to employ information, materials and findings related to this issue in chapter four in which great emphasis was given to the general characteristics of the industry itself in terms of its development, changes in processes and operations, characteristics and structure, and organization. In addition, issues and aspects relevant to operations of the LCI were used to interpret and underpin the study's findings.

5.2. Issues and Aspects Emerged from the Questionnaire Survey

Characteristics of key actors, features and resources of firms, construction resources and aspects of construction projects and their associated processes and operations, obstacles constraining the operations of the industry were included and discussed in the following two key issues:

1. The Characteristics of the Respondents and Firms

This issue includes four main aspects which determine the general characteristics of actors and their roles in the construction processes and operations as Table 4 explains. These are categorized under the following headings: the characteristics of actors including age, qualifications, experience, official position, motivation and history of work experience and job mobility, the features of firms including legal status, ownership, age of the firm, size, workload, turnover and type of business and training; the firms' resources including labour, construction materials, and equipment and communication tools, and obstacles constraining the industry's operations including in the operating environment, obstacles related to firms' resources and obstacles related to clients and projects.

Table 3: Key issues and aspects from the results of observation, documentary analysis, secondary data analysis, interviews, visits to firms and construction projects and other supportive research activities

Issue	Key aspects of actors of the LCI	Methods of inquiry
The construction industry in Libya	**1. The construction industry in Libya** - History - Indigenous construction - Construction processes - Transformation - The contemporary LCI	- Observation, analysis of secondary resources, secondary data analysis, analysis of interviews, other supportive research activitie, - Cases and physical and visual surveys
	2. Legal and institutional framework - Legal framework - Institutions - Role of government	
	3. The scope and role of the LCI - Place in the economy - Contribution to employment - Share in development process	
	4. Structure and organization - Composition - Construction sector - Consulting sector - Building materials and construction	
	4. Operational aspects - Concepts - Processes - Resources - Firms - Projects - Obstacles and constraints	

Moreover, results and information relevant to this issue are liked, and this enables the key research questions concerned with the general characteristics of respondents, features of firms, and obstacles impeding their operation to be understood. This information was employed in chapter seven. Chapters six and eight also generally based on theses issues.

2. The Characteristics of Projects in Libya's Construction Industry

This issue includes variables which affect construction projects and form their general characteristics, such as:

1. The characteristics of the project (type, size, value, client, duration, etc.), procurement methods (estimation, competition process, type of contracts, subcontracting), duration and overrun, etc.
2. Design processes (design, communications, type of design contracts, production processes, etc.); and
3. Obstacles and problems (planning and design, environment, lack of resources, social and cultural context, misconceptions). Table 5 illustrates this issue.

Table 4:.Key issues and aspects of the key actors and firms based on the results of observation, documentary analysis, secondary data analysis, interview survey and other supportive research.

Issue	Key aspects of actors and firms of LCI	Methods of inquiry
The characteristics of actors and their roles in Libya's construction industry	**1. Respondent characteristics** - Age - Qualification - Experience - Official position - Motivation - Job history & mobility - Relocation	- Questionnaire; client, contractors and consultant - Semi-structured interview - Secondary resources and data analysis - Visits to firms and projects (cases)
	2. Features of firms - Legal status - Ownership structure - Starting-up - Size - Workload - Nature of activities - Turnover - Management and training	
	3. Resources of firms: - Communication and information - Source of Labour - Source of construction materials - Finance of projects - Equipment - Subcontractors	
	Obstacles constraining operation: - Obstacles related to operating environment - Obstacles related to firms - Obstacles related to clients and projects	

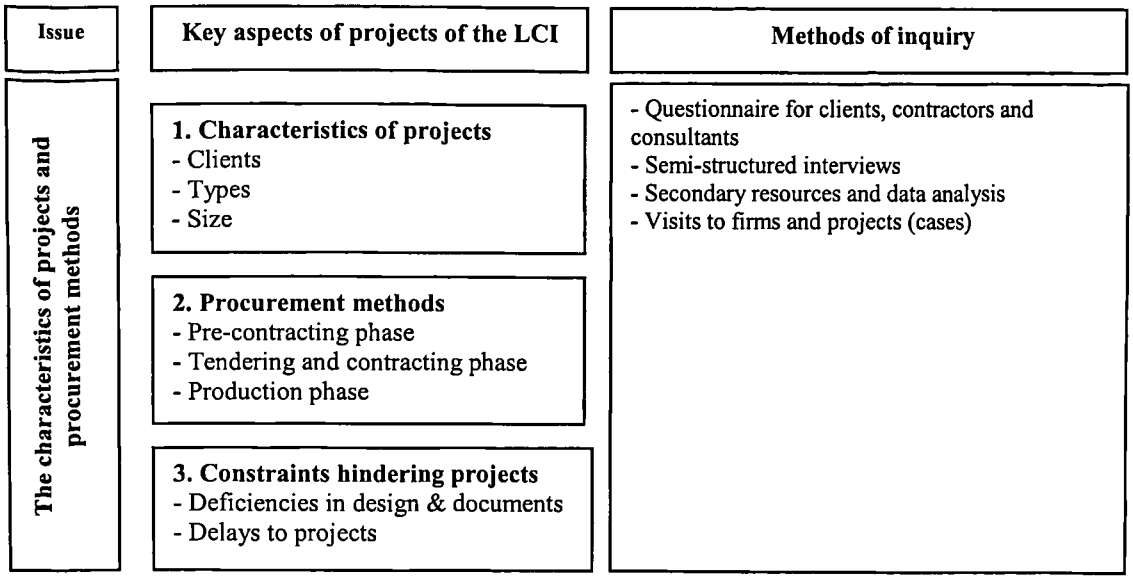
Information on this issue contributes to answering the central research questions relevant to construction projects in the LCI. Chapter eight is based on the information concerning this issue (see chapters 7 and 8). It is believed that this approach to categorization enables the analysis and

discussion to be organized in accordance with the aims and the objectives of the study and the central and secondary research questions to be answered precisely.

6. Organizational Framework

Based on the above, the findings of the empirical research were analyzed, synthesized and categorized in accordance with the study's purpose and scope, the research questions, aims and objectives, and the research methodology. Furthermore, key findings of the study are reported, discussed and interpreted according to this organizational framework. Therefore, the discussion and analysis chapters of this study are structured around the research questions.

Figure 5: Variables of the characteristics of projects and procurement methods in the LCI from the results of the questionnaire survey.



The findings, opinions, views, perceptions, comments and information that emerged from the analysis of the collected data were organized into four main chapters. This concern:

1. Development and organization of the Libyan construction industry (chapter four).
2. The general characteristics of key clients, consultants and contracytors and firms (chapter seven).
3. The general characteristics of construction projects (chapter eight)..
4. Obstacles constraining the operation of the LCI (chapter nine).

This organization allows the research questions to be answered one by one, and the study's aims and objectives can be achieved in subsequent chapters. However, when these chapters are combined together in chapter nine, their overall outcome gives a full picture of the LCI, and addresses its key issues and aspects as well as the major obstacles constraining its operation.

Appendix D: Legislation Affecting the Organization and Operation of the Construction Industry in Libya

(A list of laws and regulations relevant to construction sector)

No. of Law/ Decision	Date of issue	Concerns	Influence on the Construction Industry
Law No. 343 of the year 1977	1977	Contracting in the construction sector was limited to public and international companies. The private sector was prevented from undertaking contracts.	The CI was organized around the public sector The private sector was prevented from being involved in formal construction contracts. Private companies and factories were reorganized to meet the principles of public and partnership principles.
Law No. 4 of the year 1978	1978	Concerning the proprietorship of real estate. According to articles 1 and 2 any Libyan citizen has the right to build and own only one house.	Private construction investment in housing for selling and renting was prevented. Traditional renting of houses was seen as a kind of exploitation and control of other persons' basic needs.
Law No. 15 of the year 1981	1981	Concerning salaries and wages of Libyans in government departments and public companies and establishments	Salaries of managers, professionals and workers in the CI were controlled and determined by this law The implication of this law limits the motivation of industry's staff
Decision No. 1351 of the year 1981	1981	Preventing the import of some construction goods and restricting the employment of foreign workers	Shortages in imported construction goods and equipment-Shortages in construction workers The prices of construction materials increased and some were soled in the black market
Law No. 4 of the year 1984	1984	Preventing the rent of houses to Libyans. According to this law, renters became owners.	Restricted the operations of the private sector in housing construction industry. Protected renters of house and allowing them to be owners.
Laws No. 8 of 1988, and No. 427 of 1989	1988 and 1989	Regarding the public ownership of state-owned companies and factories	Public firms were owned by workers and managerial and technical staff according to the rules of public ownership
Decisions No. 48 and 422 of the year 1989	1989	Regarding the principles and rules allowing the domestic and private sectors to run business in trade and the distribution of goods and services.	The state allowed the private domestic sector to distribute goods and services The process of privatization of public distribution companies and centres for construction materials was started.
Law No. 9 of the year 1985	1985	Allowing Libyans to form and establish small and medium firms (Tasharrukyya) according to partnership principles.	Individuals involved in running and establishing small cooperative in the consulting and construction sectors and other services according to partnership principles. The public sector started losing its key role in the economy

Decision No. 195 of the year 1991	1991	Concerning the employment of foreign workers in the CI	According to this decision, foreign workers was limited to those with specific and high skills. Local construction firms must obtain permission to import foreign workers.
Law No. 9 of the year 1992	1992	Concerning the establishment of partnership firms	Libyans citizens are encouraged to run and establish firms in the CI according to the principles of partnership The number of partnership firms since rapidly increased
Law No. 300 of the year 1993	1993	Concerning the acquisition and privatization of state-owned companies and factories	The public construction sector underwent a slow process of privatization since the second half of the 1980s. Consequently, a large number of public factories, establishments, state-owned organizations and companies were privatized.
Law No. 5 of the year 2004	2004	Regarding the encouragement of foreign investment in Libya.	The role of the foreign sector is expected to grow in the future
Decision No. 8 of the year 2004	2004	Concerning the tendering and contracting procedures of construction projects	Formal tendering and constructing processes are controlled by the principles of this decision. Contracts of standard form are used in all formal construction projects Projects are based on traditional procurement systems.
Decisions No 211 of the year 2003, and Law No. 13 of the year 2005	2003 and 2005	Concerning activities permitted for foreign companies branches in construction sector in Libya.	Activities of foreign firms were limited to complex and sophisticated large projects
Decision No. 22 for the year 2003, and Law No. 5 of the year 2004	2003 and 2004	Concerning the boosting of foreign investment in Libya and permission for investors to undertake investment activities in the county.	Foreign investment in construction was expected to increase in the future The role of foreign investment will contribute to financing the operations of the CI

Appendix E: A sample of interviews transcriptions, ANOVA test, the visual survey and observation

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University of Newcastle Upon Tyne

Survey of the Libyan Construction Iindustry
Semi-Structured Interviews with Decision Makers
D.M:1

Ministry: General People's committee for Services Affaires
Interviewer name: A, S. City: TripoliTime of interview:11.30 am
Designation: The interviewee was 50 years old; he has been working as a government employee for twenty-five years. He has valuable experience in the construction and building sectors in terms of planning, supervision and training issues. At the time of this study, he was the general manager for the Directorate of Companies in the General People's Committee for Services Affairs (Council of Ministries).The Directorate was responsible for issues related to public and construction firms in terms of organization, supervision and registration.

Questions	Answers	Key words and themes
The construction industry.	From my experience, I think that the CL in Libya can be defined as those public and partnership firms and organizations which are engaged in the construction of buildings and infrastructure projects..	- Lack of a clear definition
Role of the CI.	Obviously, as you might know that, the development budget includes hundreds of construction projects at both national and local levels.... Libyan public and partnership as well as foreign firms operate these projects....I believe that, the construction industry can contribute significantly to tackling the problem of unemployment.... Also, it helps other sectors, such as, the building materials and transportation sectors, to grow.	-. The CI is viewed as a service sector. -. operations of the LCI are dependent on state development budgets
Strengths and weaknesses of e LCI.	Overall, I am not pleased about the sudden changes and reforms in the construction and building sector over the past two decades..... For example, since 1978 the CI experienced intensive changes in terms of their organization and ownership structure.....The state encouraged the industry's staff and workers to be partners in their firms ..... In 1980, only public and foreign firms were allowed to operate in construction businesses..... Then, by the mid 1980s, the state adopted the partnership system as a mean to reorganize the LCI. .....From my point of view, this is one of the major problems in the administrative and working environment..... It means for me that there is no clear strategy for organizing the industry.....Today, a majority of firms operating in the market were established over the last ten years .... This means that they have little operational experience and lack money, equipment and plant .... So if you look at the follow-up reports on the implementation of the development budget for the past financial yars, you can note that a large number of projects are suspended, stopped and delayed.....	-. Changes in the role and organization of the industry -. Instability -. Delays to projects and in payments

Role of the state	As far as I am concerned in terms of construction firms affairs, I am dissatisfied that there is no institution or corporation responsible for the organization and supervision of the CI .... This means that there are many government departments concerned with the operations CI, and the state does not consider the CI as an important sector..... To explain this point I can say that, the key role of state is to regulate construction business around the partnership system and to control construction quality by national construction standards and codes.....According to my experience; if you look at construction projects which are underway now in Tripoli city, you would realise that majority of projects are owned by the state.... Also, one can not find any drafts of policies concerning the CI.	-. Fragmentation of the industry -. Dominance of state
Partnership principles	In Libya, economic businesses are controlled by socialist laws.... there are three types of firms: public companies, partnerships (Sharika Musahima) and small co-operative family firms (Tasharrukea).....So, any group of Libyan people (as partners) can establish and own a firm in the CI .....Overall, over the past ten years, the number of partners has changed from 10, to 500 and lately to 25 partners..... I believe these changes affect construction business and size of firms..... Also, the organization and stability of firms, relationships between partners and clients of projects .....From my experience, today, there are many cases of projects which were stopped or suspended because the firms which had been contracted to construct them were closed down or amalgamated with other firms. I think such circumstances cause problems to the clients of projects in terms delays and high cost overruns.	- Partnership - Instability of legal framework
Construction is undesirable fir Libya	I think the simple answer is that Libyans see construction work as hard and requiring craft knowledge and skills..... According to my observations and experience, Libyans work in construction as designers, site managers, supervisors and administrative managers.... Work in construction is associated with a very low reputation .... Added to this, hard construction operations are unattractive for Libyans.....	- Construction is unattractive occupation - Social and cultural reasons - The role of the CI in employment
Reliance on foreign workers	I think this is because Libya lacks skilled construction workers and surrounded by many countries such Egypt, Tunisia, Sudan etc.	- Demographic, social and political factors
Domination of foreign workers.	I completely disagree with this view. Because, today, a majority of small and medium construction projects are operated by Libyan domestic partnerships and co-operative family firms.	- The role of local firms
Three key obstacles hindering the operations of the industry.	I think that the instability of laws... A lack of efficient consultancy and construction firms.... Delays in payments to contractors, changes in the prices of construction materials and the cost of labour, and competition and operation processes are affected by social pressure. These are the most restrictive hindrances.	-. Stability of legal framework -. Inflation -. Training -. Delays in payments
Suggestions to eliminate obstacles.	I suggest the stabilization of the legal and administrative environment... Talking the problem of delays in payments and to projects.... Encouraging Libyan youth to be involved in construction work..... Overall, I believe that without taking action to develop planning and management of construction projects no significant improvement in the industry's operations can be achieved.	- Satiability of the operating environment -. Long-term strategies in education and training
Capacity and capability of the industry	No. according to my experience, the current capabilities of Libyans firms unable to undertake large and complicated projects ..... For instance, projects such as construction of wave barriers in Tripoli port and construction of the Trail-Alkurnish road from Tripoli-Tajura have not been completed yet because they were operated by two Libyan public companies..... So, I believe that, in the future, there will be a need for foreign enterprises in Libya, particularly, in large infrastructure, industrial and energy projects.	- Low capability of local firms

Construction duration	Absolutely. No....From my own experience and my current managerial position I have a sense that the planning of a majority of construction projects does not take enough time. I am sure that projects are generally studied and designed within a very short time..... I believe that the main reason is that there is no clear plan regarding the construction projects to be designed and constructed each year.	- Project planning and management
Delays to projects	Yes.... I think that there are many causes underlining the current long construction duration of projects ..... Poor planning of projects, incomplete drawings and documents, delays in payments to contractors and inefficient contractors are the most important causes. Obviously, the poor performance of contractors and shortages in cement and steel are main factors.... In general, delays in payments to contractors by the General People's Committee for Finance are one of the major problems..... added to this, there is no clear contractual strategy..	- Managerial, technical and administrative factors - Delays in payments
Procurement methods	This is perhaps because a majority of projects are owned by the state, and clients and consultants lack knowledge and experience in other contracting methods. ....Also, I believe that this method is well known in Libya's construction market....Also, current contractual regulations are inflexible.	- Dominance of the state - Inflexible contracting system
The dominance of small firms	I think that it is not easy for firms to be big in Libya. ..Majority of firms are established recently... local firms lack money, construction equipment and efficient management...I think those firms do not trust clients in terms of payment....Also, many firms are not interested to involve in bank loans and credits...	- Administrative, social and cultural factors
Future of the LCI	From my experience, I think that demand for construction projects will increase in the coming years..... There is a strong commitment from the state to cope with housing shortages..... the state has encouraged foreign companies to invest in construction... I expect hat, in future yet ars, many projects in the petroleum and tourism industry will be constructed by foreign firms.....	. Construction boom
Perceptions of the industry	S 1. Clients prefer to contract with foreign contractors rather than Libyans Y S 2. Employment in construction is not attractive for Libyan workers Y S 3. Contractors were viewed as bourgeois exploiters over the past two decades Y S 4. Tribal and friendship relationships are important in obtaining work Y S 5. Consulting sector lacks experience in design and project management N S 6 Construction activities are based on cement and concrete Y S 7 Consultants and construction firms get all their payments on time N S 8 During operation and production processes, there is a huge amount of waste materials Y S 9 Projects are not completed within planned budgets and contractual duration Y S 10 The administrative, economic and legal context restricts the industry's operation Y S 11 Local consultants and contractor firms have a good reputation N S 12 Construction activities consume much water Y S 13. Projects are separated into design and construction phases Y	

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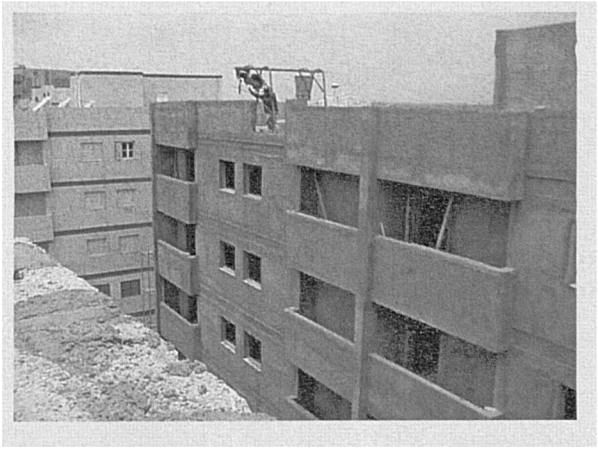
University of Newcastle Upon Tyne

Surveyof the Libyan Construction Iindustry
Project manager

Name of project:
Interviewer name: N,L.
No of interviewer: -1-
(summery)

Position: Site manager
City: Tripoli
Date: 21.4.04.

Designation: the interviewee is a 47 year old, civil engineer. He graduated in 1980. Over the past twenty years, he has managed a number of building and civil construction projects. His experience is focused on construction and project management (Tripoli, Alkalij, Benghazi and Sebha regions). At the time of the study, he was the site manger of the construction of 100 housing units in Tripoli city. The interview was carried out on the construction site.

Questions	Answers	Key Words and Themes
Q. 1. .client of the project?	The Real Estate and Savings Bank (owned by the state)	- Traditional procurement systems - Cement are key construction materials - Water is important in terms of affordability and quality - Construction fails to attract Libyan workers
Q. 2. The key role of the company in this project?	Overall, our main role in this project is construction only... We supply labour and materials...On the other hand, the client's engineers control the quality of our works.	
Q. 3. Operations-based on cement?	From my experience, I think that construction is heavily dependent on cement. Throughout my experience, I have managed many projects, all were produced by concrete....Also, shortages in cement supply were responsible for delays to many projects ..... It seems to me that construction in Libya cannot operate without cement, concrete, cement brick....	
Q. 4. Operations consume water?	Surely, water is a serious problem in Libya..... sometimes, we could not obtain water from the municipality's network due to shortages in supply....Also, the client's engineer refused using water because it was salty....To avoid this problems, we use our truck to supply water in a tank from water wells in the area....	
Q. 5. Construction is unattractive?	According to my experience, Libyans are interested in working as professionals and administrative jobs.... Perhaps the main reasons are: they can find official jobs in the public sector and companies... Also, it seems that, in they eyes of Libyans, construction is seen as difficult and risky work....Added to this, foreign workers are dominant in construction.....Also, from my experience, Libyans lack construction skills and the management of Libyans workers is very difficult because of the influence of social and friendship relationships	
Q.6. Current capacity and capability?	Generally, I can say that local consultancy and construction firms have the ability to design and construct small buildings and infrastructure projects, if delays in payments and shortages in cement and skilled labour are tackled..... Also, I think joint ventures with foreign firms may increase the capability of Libyan firms and may help develop management skill in the LCI.	
Q. 7. A long Construction duration?	Overall, yes. But I believe that delays in payments to contractors, mistakes in drawings and documents, slow in decisions making by clients... I think that, shortages in materials and skilled labour as well as changes clients are responsible for prolonging the construction duration of many projects.	- Causes of a long construction duration - Deficiencies in contact documents - Mistakes in drawings and unclear specification - Incomplete documents

Q. 8. Specifications and codes?	From experience, I think that there are exaggerations in specifications of most construction projects.....Also, the industry's operations are based on one set of national construction specifications and standards... I used to manage many projects in the heart of the desert areas and their specifications are similar to those constructed in Tripoli. ...I think this is inappropriate in terms of cost and climatic circumstances.... For example, the mountain regions should have their own construction specifications and standards.	- Design lacks buildability - Concerns about specifications and construction codes - Buildability - Specifications
Q. 9. Changes of design?	Yes, I think changes in design are common in construction everywhere.... In Libya, generally, changes are usually associated with changes by the client or in the function of the project.....Also, I have experienced many other causes such as mistakes in design drawings and documents, delays of imported materials, a lack of technical staff, and materials and components which fit to a project specifications.	
Q. 10. Deficiencies in projects documents?	I believe that unclear specifications and incomplete documents are the two factors which cause the majority of problems during construction processes.... Clients usually invite companies to prepare their bids before all design drawings and contract documents are completed....Later on, they realize that there are many mistakes in drawings and bills of quantities and contracts include unrealistic terms and conditions....	- The role of informal workers in the operation of the LCI - The role of informal workers
Q. 11. Casual and informal workers? .	Yes, sure,. now in this project, I have three groups of subcontractor firms of informal workers.... We contracted with a group of informal Ghanaian workers to carry out plastering *work.....Also; electrical works are conducted by Egyptian and Pakistani workers.... I think* casual workers are important sources for labour because the government does not allow to us *to import foreign workers.....I think this is one of the obstacles which hinder our operations.*	
Q. 12. Causes of delays to projects?	I strongly believe that delays in payments to contractors, unstable administrative sector, lack of skilled site managers and workers as well as inefficient subcontractors are the most key causes of delays to projects.... Also, shortages and irregular supplies of cement and poor project management should be mentioned.	- Administrative, financial and management are key causes
Q. 13. Causes of overrun costs of projects?	I think this is mainly because not enough time is given to preparing bids..... Add to this a lack of experience among surveyors, incomplete drawings and unclear specifications, administrative corruption, inflation and the unstable exchange rate of the LD against foreign currencies are important factors.	- A short time for preparing bids - Experience of surveyors - A lack of buildability
Q.14. Future of the LCI?	From my own experience, I believe that in a country such as Libya which has been under sanctions over nearly two decades... I think construction activities will increase in the coming years...But, I think that the current management in Libya's administration and the CI could not cope with this increase in new construction and maintenance....Also, it seems to me that administrative corruption would affect the future operation of the LCI.	- The current management - The impact of administrative corruption and social pressure
Q. 15. Other opinions and views?	From my experience, I think that the state should give more attention to tackling uncomfortable working circumstances .....I suggest that Libyan consultancy and construction firms should be given more financial support in terms of access to work, loans and credits....Overall, I believe that any investments in developing the LCI will enable the country to sustain its development in terms of construction and its related activities	- Supporting local firm - Tackling obstacles.

No.	CON/A	0	1		
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University of Newcastle Upon Tyne

Survey of the Libyan Construction Iindustry
Producers
F.1
Financial institution

Interviewer name: A.A.
Position: General Manager of the Director for the Technical affair
No of interviewer: -2-
City: Tripoli
Date: 14.03.04

Designation: the interviewee was a 54 year old a senior key manager (General Manager of the Directorate for the Technical Affairs) in the Bank of Real Estate Investment and Saving. Over the past twenty years, the interviewee gained considerable experience in construction investment and project planning.

Questions	Answers	Key Words
1. Financial services to the CI?	Our bank is owned by the state. It offers construction loans for individuals across the whole country...Also, it is directly involved in investment in residential and official buildings.... currently, the bank does not offer any direct financial services to contractors and consultants.... But many of our projects are designed and constructed by Libyan firms.	. Indirect relationships between the bank and the CI
2. The level of demand for construction loans and bank credits?	Of course, there is intensive demand for housing loans..... I see housing shortages as a serious problem.... Because of our limited financial resources, it is difficult to cope with this demand ..... Added to this, many persons who have obtained loans from the bank over the past years did not repay them.... I think the investment climate in construction in Libya is risky in terms of providing financial services to construction firms in the CI.... Ownership and management patterns often change .... I believe that offering finance services to contractors could not be free from high risk.	- Risky financial services environment
3. The dominance of small firms?	Firms are small because the state established large public firms in the 1970s, 1980s and 1990s and then it restructured the construction industry.....Thus a majority of these firms were closed down.....presently, domestic partnership and family firms are small because they lack money, experience and equipment. I think that partners are not so interested to make their firms larger in terms of workload..... From my view, this is mainly because they lack trust and certainty in clients and the working environment.	- Partners are not interested to expand size of their firms -. Lacks of trust and certainty are key factors
4. Suggestion for improving the financial climate?	...The financial sector in Libya is still managed by the public sector.....I mean that the bank sector should be liberated from the direct involvement of the state and encouraging the private sector..... Over the past three years there were signs of this trend but the process is slow and is still restricted by many factors... For example, the unstable exchange rate of the Libyan Dinar should be considered....Also, the taxation system should be revised...I think this will encourage small firms to grow... I think this will increase collaboration and co-operation between the industry and the financial sector.	-. A lack of an efficient financial sector - Quality of data and information
5. The future of the industry?	Generally, I have no doubt that construction activities will increase in the coming years in Libya.... But I have two points in this regard.... I think that competition between firms in the market will increase and also the type	- Construction will be booming -A Poor response from the financial

	of products and quality of products and services will also change. From my own view, the increase in construction activities will be restricted by shortages in resources and a poor response from the financial sector…	sector
6. Statements about the LCI?	I do not see any efficient actions and plans from the state aiming at preparing the financial sector and the construction industry to face the future changes and challenges in the construction market….. There have been many attempts but the consequences on the ground are not yet clear.	- No clear plans to prepare the industry for future changes and challenges

No.	CON/A	0	1		
date	23	03	2004		

University of Newcastle Upon Tyne

Survey of the Libyan Construction Iindustry
The Research Centre for Construction and Building materials

Research Centre: Construction and Building materials
Interviewer name: A, M.
Position: Director for the Department Construction Materials
o of interviewer: -1-
City: Tripoli
Date: 23.03.04

Designation: the interviewee was 49 years old, he has been working in the centre since 1990. He has considerable experience in research and development related to construction and building materials in Libya. The interviewee was a member in many national committees related to construction policies, technology and materials.

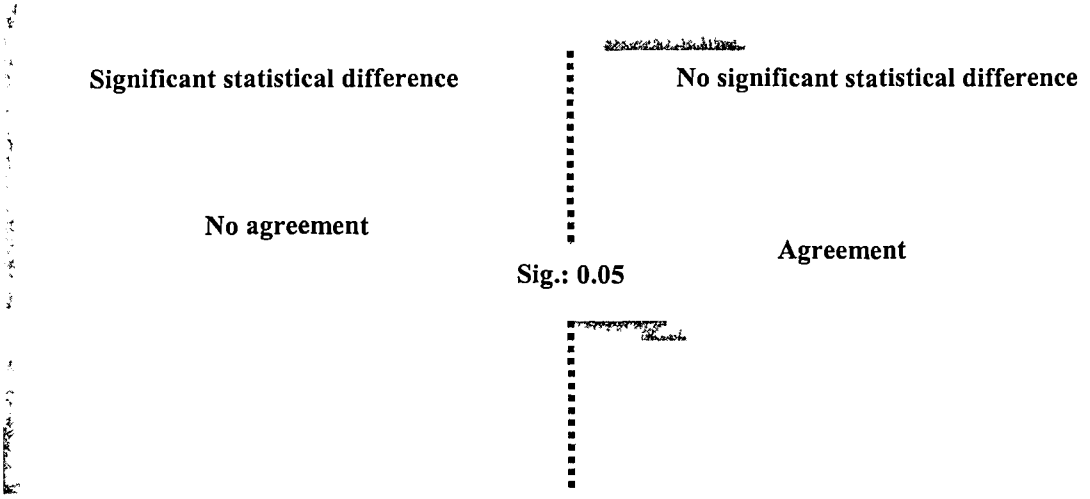
Questions	Answers	Key Words
Q. 1. Previous research?	I am sorry to tell you that, in general there are no key studies investigating the CI as a whole.... I believe this may be because there is a lack of clear understanding of the CI as well as co-operation and collaboration between different departments which are involved in its supervision and operation.... Most research efforts are generally focused on issues related to construction technology and materials.....for instance, many papers related to structure and construction materials were presented in the First and Second National Conference on Construction Materials and Structure in Libya.	- No major studies about the LCI - Poor co-operation and collaboration - Research is focused on construction materials and technology.
Q. 2. Major issues of the LCI ?	I think the key issue is unstable working circumstances in construction and the building sector....The supervision and management of the construction sector changed from one secretariat to another....Also, firms working in this have been restricted by unreliable laws and conditions in terms of establishment, labour, importing equipment and materials etc..... Although, delays of payments for contracts by government departments is a serious issues.....Also, shortages in cement and steel and sudden increases in their prices are important issue.....but from my point of view, the most important issue is that little efforts have been made to research the industry and its problems .....added to this failure to implicate findings and recommendations of previous studies.	- Unstable working circumstances - Fragmentation of the industry - delays in payments to contractors - No research works
Q. 3. The LCI's operation is cement-based?	Obviously, it was noted that cement and products such as concrete, steel, brick, tiles, press-stressed concrete beams and many others are dominant construction materials in Libya's construction market. .....Also, construction skills and experience in Libya are generally related to cement and concrete work.....I can say that in Libya without cement there would be no construction at all.....I quite agree that operations of the LCI are cement based.	- Type of construction materials - Cement position in the operation of the LCI
Q. 4. The LCI's operation consumes to much water?	This is a good question. I think in Libya's environment, water is valuable and a limited natural resource. ...from my previous experience, I did not find any attempt to consider the position of	- Water is a key issue in the operation of the LCI - The relationship between construction

	water in the operation of the CI in Libya.... To answer this question may we need to consider the impact of the quality of water on cement and concrete production and products....overall, I believe that the operations of the LCI consume too much water when we consider shortages in water supply, and quantity and quality of water in Libya.	technology and construction materials - Management of water in construction in arid and semi-arid countries.
Q. 5. Major obstacles restricting the operations?	Unstable laws and administration is one of the major obstacles..... Previously, I have mentioned the problem of delays in payments to contractors and to projects. .....Also, planning and designing of projects is weak...incomplete drawings and documents cause delays to projects and cause problems between clients and contractors.... From my experience, I think lack of experts in the CI can be considered as one of the obstacles.....current educational and training programmes are not concerned with practical aspects...Also, there are no clear strategies and plans to develop the LCI .....These are associated with lack of data, information and studies about the LCI and its associated operations.	- Instability - Lack of construction and planning and management - Lack of experts in the CI - Training and education - Lack of strategies and plans - Lack of data, information and studies
Q. 6. Current capacity and capability?	Overall, over the past ten years, the capacity of the LCI has increased.. .Today, a majority of construction projects are designed and produced by local firms.... But I am concerned about the quality of the products...In general, most projects constructed by local firms have low quality in terms of construction and performance.....I strongly believe that local firms cannot construct large and sophisticated projects such as airports, energy and industrial plants, large infrastructure projects, oil and tourism industry etc. ....Foreign firms are necessary to undertake such projects...	- The capacity of local firms - Quality of operations - The future role of foreign firms
Q. 7. A long construction duration?	Yes, generally, a majority of projects have a long construction duration. ....As I said before, this is because of a lack of efficient management and delays in payments to contractors..... as well as the absence of cooperation and collaboration between clients, consultants and contractors.	- A bit of concern about construction duration
Q. 8. Traditional procurement systems?	I think the key reason is because it is a well known method among clients, consultants and contractors...Also, it may be because the current contractual systems are old and new contractual agreements are not allowed..... Although, the state is a dominant client of construction projects..... Also, it may be because clients of projects like to control their projects in terms of design, specifications and cost.	- Popular method - Projects owned the state - Lack of experience - Unfixable contractual regulations
Q. 9 The rate of the LCI?	Overall, very bad because a majority of projects have a long construction duration and delays.	- The industry has poor reputation
Q. 10. The future of the industry?	I think the growth and development of Libyan firms, the ability of the state to tackle the problems which cause delays to projects and creating a suitable economic and operational climate for the industry will determine the future of the industry .....Also, I think that construction activities will increase in Libya in the coming year. ....hundreds of housing, building and infrastructure projects are expected to be started in the country...	- Future policies and actions will determine the future - The features of future working environment - Increase in construction activities
Q. 11. Perception?	**Statements**	
Statements concerning the LCI?	S 1. Clients prefer to contract with foreign contractors rather than Libyans	N
	S 2. Employment in construction is not attractive for Libyan workers	Y

	S 3. Contractors were viewed as bourgeois exploiters over the past two decades	Y
	S 4. Tribal and friendship relationships are important in obtaining work	N
	S 5. Consulting sector lacks experience in design and project management	N
	S 6 Construction activities are based on cement and concrete	Y
	S 7 Consultants and construction firms get all their payments on time	N
	S 8 During operation and production processes, there is a huge amount of waste materials	Y
	S 9 Projects are not completed within planned budgets and contractual duration	Y
	S 10 The administrative, economic and legal context restricts the industry's operation	Y
	S 11 Local consultants and contractor firms have a good reputation	N
	S 12 Construction activities consume much water	Y
	S 13. Projects are separated into design and construction phases	Y

ANOVA Statistical Tests

ANOVA is called analysis of variance because it examines the variability of the sample value. It is statistical techniques exist in SPSS.



1. If the Sig. (P) value is grater than 0.05, the null hypothesis is accepted and the result is not statically. Significant
2. If the Sig. (P) value is less than 0.05 but grater than 0.01, the null hypothesis is rejected and the result is statically significant.
3. If the (P) value is smaller than 0.01, the null hypothesis is rejected and the result is statically significant beyond 1 per cent level. Therefore, it should be noted that the probability associated with F is given in the final columns. If it is less than 0.05, this shows that there is a statistical significant difference between the groups being compared (Foster, 1993, p.140).

ANOVA results in relation to some of respondents' characteristics

Personal characteristics		Sum of Squares	df	Mean Square	F	Sig.(P)	Statistically different
Age	Between Groups	.352	2	.176	.392	.677	No significant difference
	Within Groups	47.167	105	.449			
	Total	47.519	107				
Work before joining this Organization	Between Groups	9.921	2	4.961	3.274	.042	Significant difference
	Within Groups	159.069	105	1.515			
	Total	168.991	107				
Educational level	Between Groups	37.852	2	18.926	14.818	.000	Significant difference
	Within Groups	134.111	105	1.277			
	Total	171.963	107				
Type of qualification	Between Groups	48.699	2	24.350	30.502	.000	Significant difference
	Within Groups	83.819	105	.798			
	Total	132.519	107				
Official position in firm	Between Groups	10.014	2	5.007	3.679	.029	Significant difference
	Within Groups	142.903	105	1.361			
	Total	152.917	107				
Reasons of working in construction	Between Groups	74.264	2	37.132	22.615	.000	Significant difference
	Within Groups	172.403	105	1.642			
	Total	246.667	107				
Period of working in the current firm/organization	Between Groups	36.681	2	18.340	14.337	.000	Significant difference
Period of working in construction	Between Groups	.574	2	.287	.129	.879	No significant difference
	Within Groups	233.528	105	2.224			
	Total	234.102	107				

ANOVA results in relation to some of projects issues

Characteristics		Sum of Squares	df	Mean Square	F	Sig (P).	Statistically different
Client of projects	Between Groups	3.343	2	1.671	2.563	.079	No significant difference
	Within Groups	138.875	213	.652			
	Total	142.218	215				
Type of projects	Between Groups	1.093	2	.547	.402	.669	No significant difference
	Within Groups	282.651	208	1.359			
	Total	283.744	210				
Role of the company in the project	Between Groups	.294	2	.147	.909	.405	No significant difference
	Within Groups	28.656	177	.162			
	Total	28.950	179				
Information about projects	Between Groups	4.822	2	2.411	.564	.570	No significant difference
	Within Groups	765.513	179	4.277			
	Total	770.335	181				
Method of estimation	Between Groups	1.620	2	.810	.711	.492	No significant difference
	Within Groups	242.819	213	1.140			
	Total	244.440	215				
Equipments employed in projects	Between Groups	7.114	2	3.557	1.867	.158	No significant difference
	Within Groups	348.671	183	1.905			
	Total	355.785	185				

NOVA results in relation to the statements about the LCI among clients and contractors

Statement		Sum of Squares	df	Mean Square	F	Sig.(P)	Statistically different
Clients prefer to contract with foreign contractors rather Libyans	Between Groups	6.002	1	6.002	1.833	.180	No significant difference
	Within Groups	268.569	82	3.275			
	Total	274.571	83				
Employment is not attractive for Libyan workers	Between Groups	5.161	1	5.161	5.320	.024	Significant difference
	Within Groups	79.542	82	.970			
	Total	84.702	83				
Contractors were viewed as exploiters and bourgeois over the past two decades	Between Groups	21.638	1	21.638	43.193	.000	*Significant* difference
	Within Groups	40.579	81	.501			
	Total	62.217	82				
Tribal and friend relationships are important in obtaining work relationships influence structure of firms and their workload	Between Groups	.875	1	.875	.707	.403	No significant difference
	Within Groups	101.542	82	1.238			
	Total	102.417	83				
Consulting sector lacks experience in construction and project management	Between Groups	.508	1	.508	.320	.573	No significant difference
	Within Groups	130.194	82	1.588			
	Total	130.702	83				
Construction activities are based on cement and concrete	Between Groups	.566	1	.566	.628	.430	No significant difference
	Within Groups	72.977	81	.901			
	Total	73.542	82				
Consultants and construction firms get all their payments on time	Between Groups	8.383	1	8.383	11.030	.001	Significant difference
	Within Groups	62.319	82	.760			
	Total	70.702	83				
During production processes, there is a huge amount of waste materials	Between Groups	24.008	1	24.008	20.360	.000	Significant difference
	Within Groups	96.694	82	1.179			
	Total	120.702	83				
Projects are not completed within planned budget and contractual duration'	Between Groups	7.875	1	7.875	9.815	.002	Significant difference
	Within Groups	65.792	82	.802			
	Total	73.667	83				
Administrative, economic and legal environment restrict the industry's operation	Between Groups	1.669	1	1.669	1.860	.176	No significant difference
	Within Groups	73.569	82	.897			
	Total	75.238	83				
Local consultants and construction firms have a good reputation	Between Groups	76.222	1	76.222	155.500	.000	Significant difference
	Within Groups	40.194	82	.490			
	Total	116.417	83				
Production processes consume a lot of water	Between Groups	29.532	1	29.532	22.009	.000	Significant difference
	Within Groups	110.028	82	1.342			
	Total	139.560	83				
Projects are separated into design and construction phases	Between Groups	.000	1	.000	.000	1.000	No significant difference

ANOVA results in relation to the statements about the LCI among consultants and contractors

Statement		Sum of Squares	df	Mean Square	F	Sig.(P)	Statistically different
Clients prefer to contract with foreign contractors rather Libyans	Between Groups	9.389	1	9.389	3.101	.082	No significant difference
	Within Groups	284.611	94	3.028			
	Total	294.000	95				
Employment is not attractive for Libyan workers	Between Groups	3.125	1	3.125	3.319	.072	No significant difference
	Within Groups	88.500	94	.941			
	Total	91.625	95				
Contractors were viewed as exploiters and bourgeois over the past two decades	Between Groups	31.580	1	31.580	56.895	.000	Significant difference
	Within Groups	51.620	93	.555			
	Total	83.200	94				
Tribal and friend relationships are important in obtaining work relationships influence structure of firms and their workload	Between Groups	1.125	1	1.125	.937	.335	No significant difference
	Within Groups	112.833	94	1.200			
	Total	113.958	95				
Consulting sector lacks experience in construction and project management	Between Groups	68.056	1	68.056	53.409	.000	Significant difference
	Within Groups	119.778	94	1.274			
	Total	187.833	95				
Construction activities are based on cement and concrete	Between Groups	.411	1	.411	.379	.539	No significant difference
	Within Groups	100.810	93	1.084			
	Total	101.221	94				
Consultants and construction firms get all their payments on time	Between Groups	126.670	1	126.670	180.904	.000	Significant difference
	Within Groups	65.819	94	.700			
	Total	192.490	95				
During production processes, there is a huge amount of waste materials	Between Groups	44.337	1	44.337	37.750	.000	Significant difference
	Within Groups	110.403	94	1.174			
	Total	154.740	95				
Projects are not completed within planned budget and contractual duration'	Between Groups	9.031	1	9.031	11.363	.001	Significant difference
	Within Groups	74.708	94	.795			
	Total	83.740	95				
Administrative, economic and legal environment restrict the industry's operation	Between Groups	1.837	1	1.837	2.089	.152	No significant difference
	Within Groups	82.653	94	.879			
	Total	84.490	95				
Local consultants and construction firms have a good reputation	Between Groups	137.503	1	137.503	301.270	.000	Significant difference
	Within Groups	42.903	94	.456			
	Total	180.406	95				
Production processes consume a lot of water	Between Groups	83.420	1	83.420	73.237	.000	Significant difference
	Within Groups	107.069	94	1.139			
	Total	190.490	95				
Projects are separated into design and construction phases	Between Groups	.281	1	.281	.235	.629	No significant difference

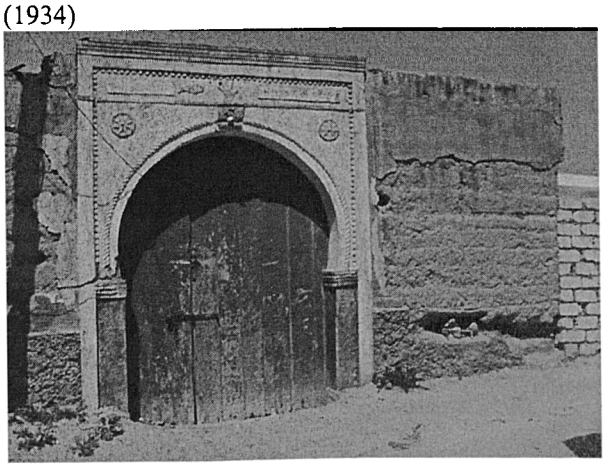
ANOVA results in relation to the statements concerning the LCI among clients, consultants and contractors.

Statement		Sum of Squares	df	Mean Square	F	Sig.(P)	Statistically different
Clients prefer to contract with foreign contractors rather Libyans	Between Groups	13.019	2	6.509	2.328	.102	No significant difference
	Within Groups	293.528	105	2.796			
	Total	306.546	107				
Employment is not attractive for Libyan workers	Between Groups	7.019	2	3.509	4.042	.020	Significant difference
	Within Groups	91.167	105	.868			
	Total	98.185	107				
Contractors were viewed as exploiters and bourgeois over the past two decades	Between Groups	44.865	2	22.432	38.538	.000	Significant difference
	Within Groups	60.537	104	.582			
	Total	105.402	106				
Tribal and friend relationships are important in obtaining work relationships influence structure of firms and their workload	Between Groups	2.463	2	1.231	.976	.380	No significant difference
	Within Groups	132.500	105	1.262			
	Total	134.963	107				
Consulting sector lacks experience in construction and project management	Between Groups	73.407	2	36.704	27.787	.000	Significant difference
	Within Groups	138.694	105	1.321			
	Total	212.102	107				
Construction activities are based on cement and concrete	Between Groups	.823	2	.411	.398	.673	No significant difference
	Within Groups	107.477	104	1.033			
	Total	108.299	106				
Consultants and construction firms get all their payments on time	Between Groups	127.282	2	63.641	91.766	.000	Significant difference
	Within Groups	72.819	105	.694			
	Total	200.102	107				
During production processes, there is a nuage amount of waste materials	Between Groups	58.088	2	29.044	25.276	.000	Significant difference
	Within Groups	120.653	105	1.149			
	Total	178.741	107				
Projects are not completed within planned budget and contractual duration'	Between Groups	14.227	2	7.113	9.622	.000	Significant difference
	Within Groups	77.625	105	.739			
	Total	91.852	107				
Administrative, economic and legal environment restrict the industry's operation	Between Groups	2.949	2	1.475	1.729	.183	No significant difference
	Within Groups	89.569	105	.853			
	Total	92.519	107				
Local consultants and construction firms have a good reputation	Between Groups	181.514	2	90.757	193.875	.000	Significant difference
	Within Groups	49.153	105	.468			
	Total	230.667	107				
Production processes consume a lot of water	Between Groups	97.681	2	48.840	42.740	.000	Significant difference
	Within Groups	119.986	105	1.143			
	Total	217.667	107				
Projects are separated into design and construction phases	Between Groups	.292	2	.146	.127	.881	No significant difference

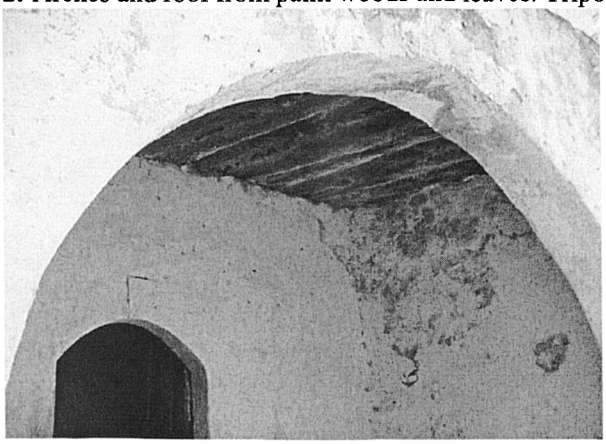
The visual survey and observation:
Indigoes construction activities in Tripoli region

During the visual survey, a set of observations led to the conclusion that people in traditional Libyan society used stone, gypsum and olive stems to construct their shelters in the northern regions. In the western mountains caves were a common shelter. Furthermore, in desert and semi-desert areas tents which suit geographical characteristics and lifestyle of nomads. Also, in desert oases, shelters were constructed from palm reeds, leaves and stems.

1. Earth–based construction, in the northern mountainous regions. Tajura city, Tripoli region (1934)

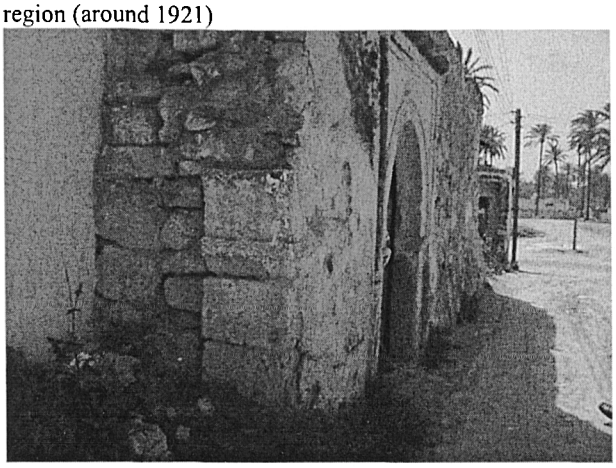


2. Arches and roof from palm woods and leaves. Tripol.

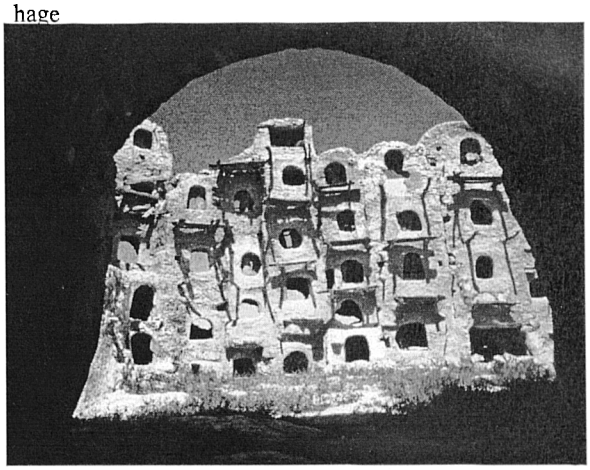


One of the key observations concerning indigenous construction materials and methods was that the production and operations processes of traditional construction activities used dry construction materials, and were generally characterized by low use of water in construction because there were acute shortages in water in such fragile environments.

3. Traditional construction building. Tajura city, Tripoli region (around 1921)

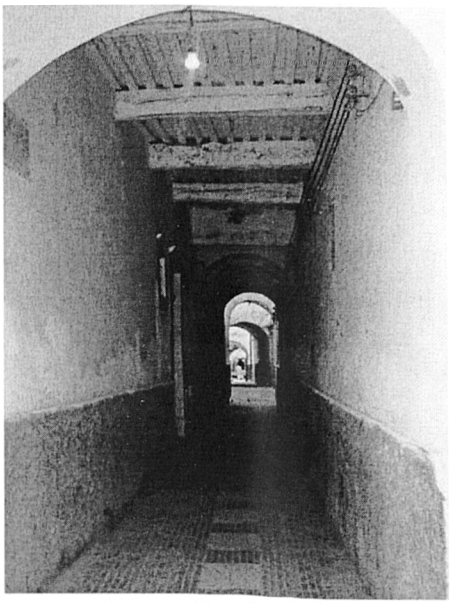


4. Stone structures on the western mountains. Gasr-El-hage

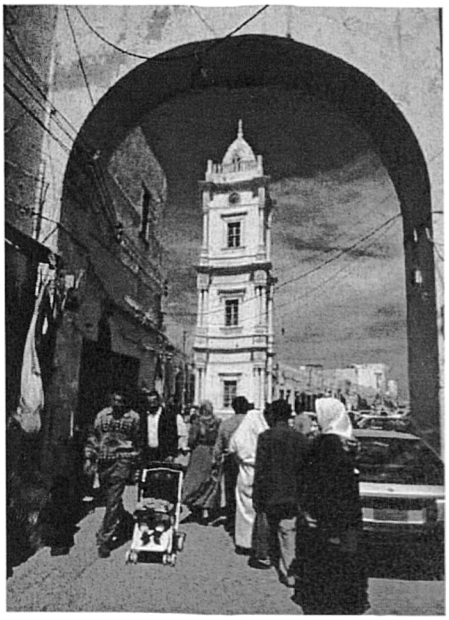


Changes in construction materials and technology

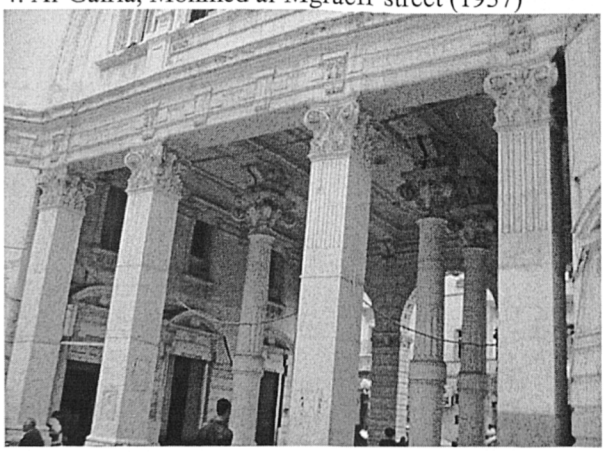
1. Changes in traditional construction activities(1865)



2. Ottoman clock tower, old Tripoli (1884)



4. Al-Galria, Mohmed al-Mgraeff'street (1937)



3. First September street (1935-1940)

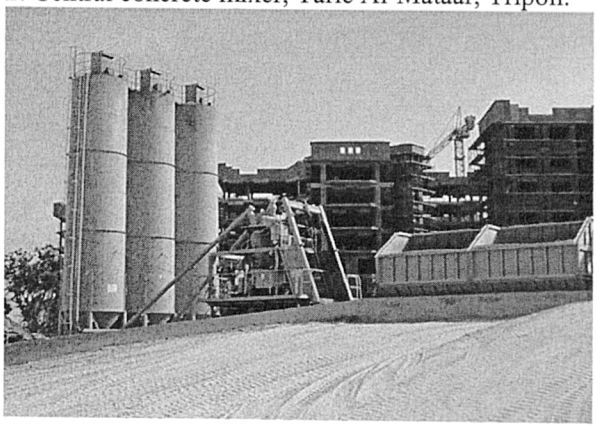
5. Hallow clay brick roofs (1932)

During the twentieth century, construction and production processes were transformed from activities based on indigenous materials and builders' experience to professional construction projects. The Italians introduced new construction materials, methods and technology of management, education and training systems. Since the second half of the twentieth century, construction was based on cement and concrete industry.

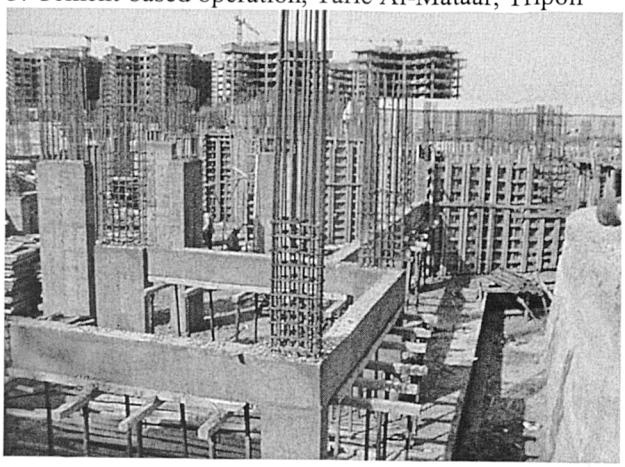
Cement and concrete-based industry

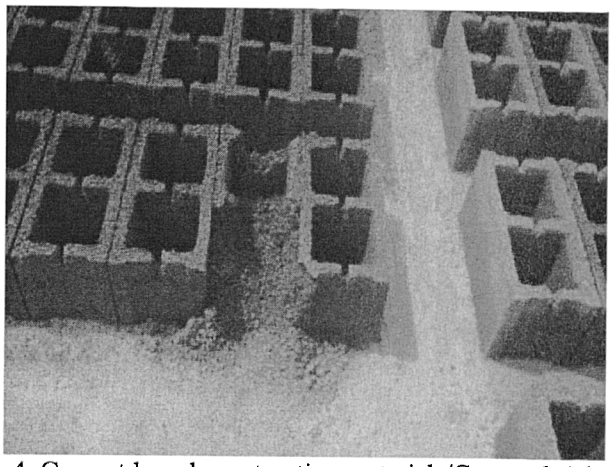
1. Informal market of cement, Tripoli.

2. Central concrete mixer, Taric Al-Mataar, Tripoli.



3. Cement-based operation, Taric Al-Mataar, Tripoli





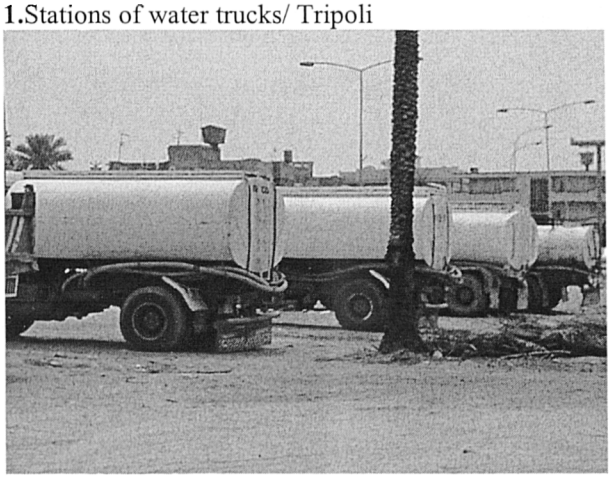
4. Cement-based construction materials/Cement brick

5. Concrete building s, Al- Hadaba Asharqiya, Tripoli.

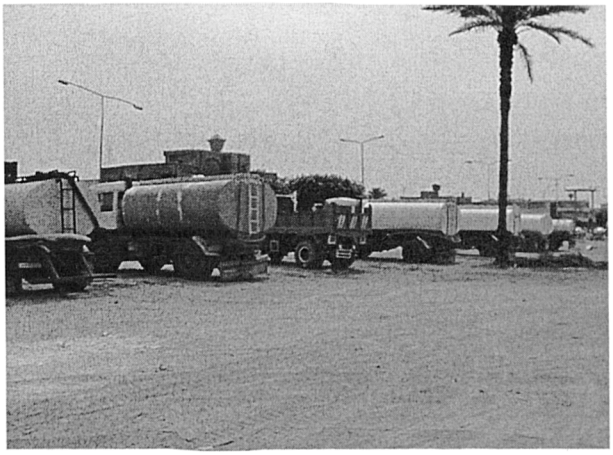
It is observed throughout the visual and the empirical survey that cement, steel, sand, aggregate and water are the most important construction materials. Also, it is recognized that the current operations of the LCI is cement-based. Thus, construction skills, knowledge and technology in Libya are generally related to the concrete industry. Furthermore, any shortages in cement and its related products affect the industry's operations in terms of processes, productivity, capability and capacity.

Water issue: stations for water tanks, Ahadsh Union, Trifoli(2004)

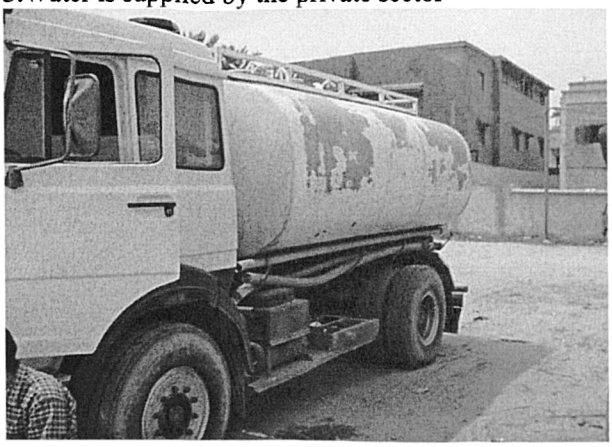
1.Stations of water trucks/ Tripoli



2. A tank of water cost between LD100-150



3.Water is supplied by the private sector

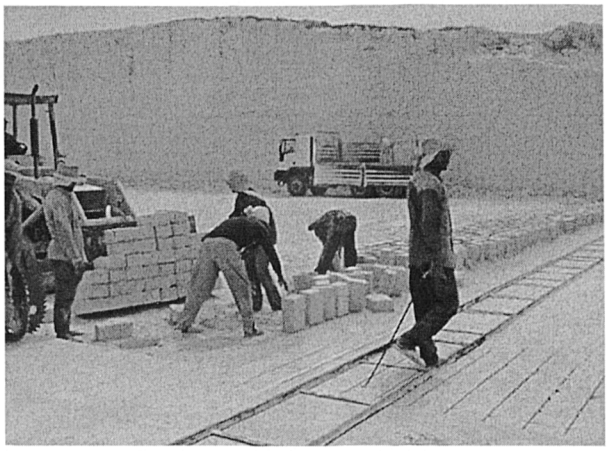


In Tripoli city and other cities and town across Libya, it was observed that stations for water trucks are very common. Water for construction was supplied by heavy trucks. Two points were recognized: firstly. a tank of water cost between LD 100 and 150; and secondly, a majority of water sources in Tripoli city are salty.

5. Wells are the main source of water

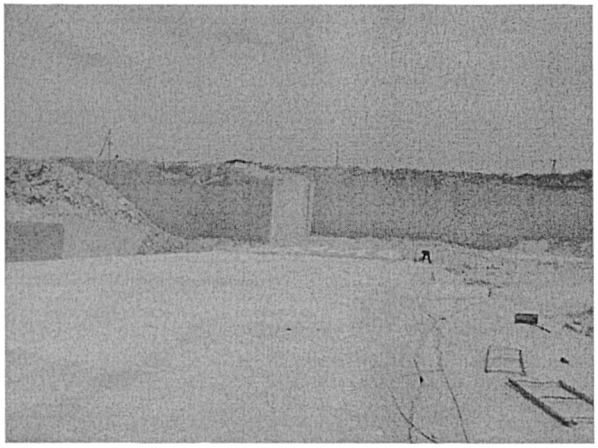
Construction materials: natural limestone

1. Production of natural block limestone Janzur,Tripoli.

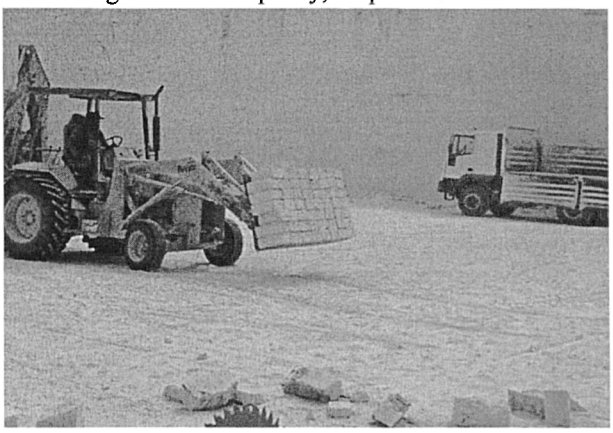


2. Production by machines and informal workers.

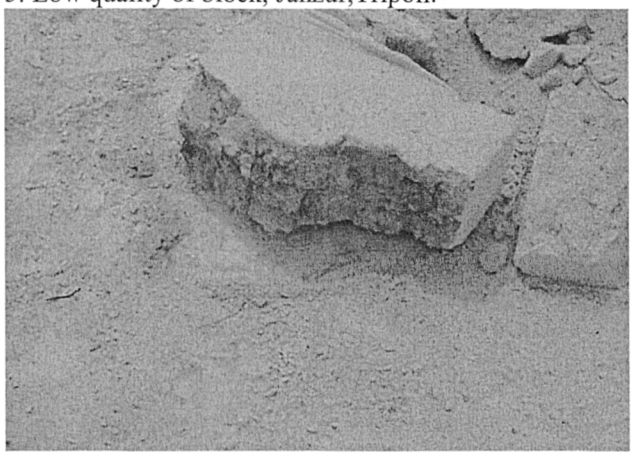
3. Impacts on environment, Janzur,Tripoli.



4. Loading of block in quarry, Tripoli.



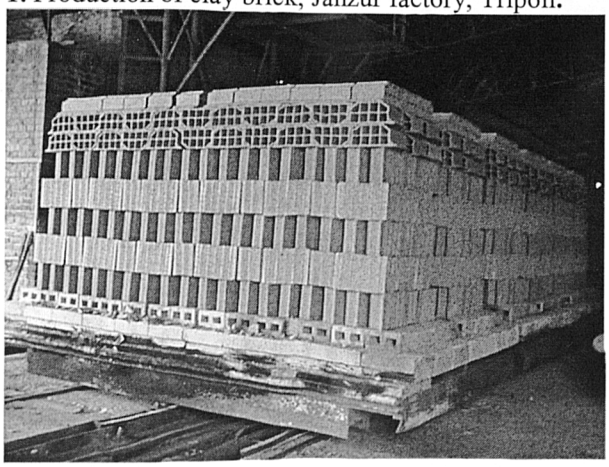
5. Low quality of block, Janzur,Tripoli.



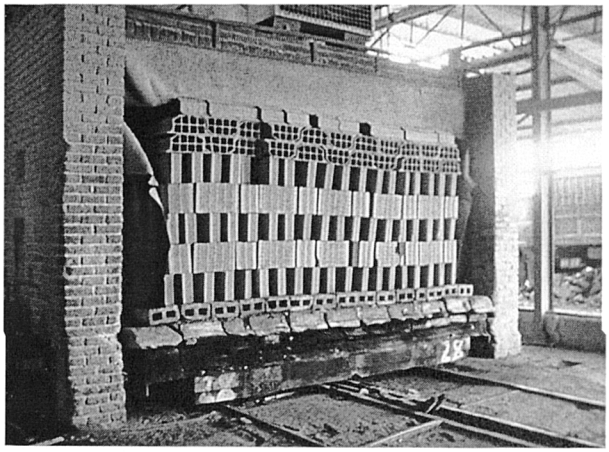
During the visual survey some quarries of natural limestone in the city of Tripoli and its vicinity were visited. The general objective was to gather information about the nature of construction materials, and how limestone is produced and supplied, because a majority of walls of buildings are constructed using these materials and cement brick. As can be seen in the photographs, natural block stone is produced by electrical machines. However, the production processes have a negative impact on the environment.

Construction materials: clay brick

1. Production of clay brick, Janzur factory, Tripoli.

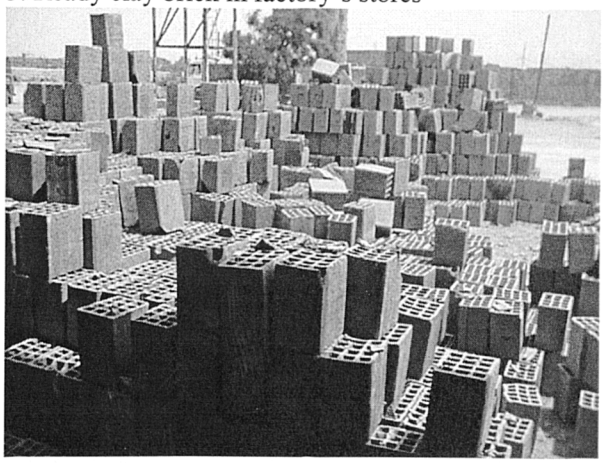


2. Ready produced clay bric, Janzur factory, Tripoli..



Manufactures producing clay brick were visited during the visual survey. Informal interviews were conducted with managers and workers. The key objective was to understand how this material is produced and supplied. It was observed that there were shortages in clay brick. To bridge the gap between demand and supply, clay bricks were imported from Egypt or Tunisia.

3. Ready clay brick in factory's stores

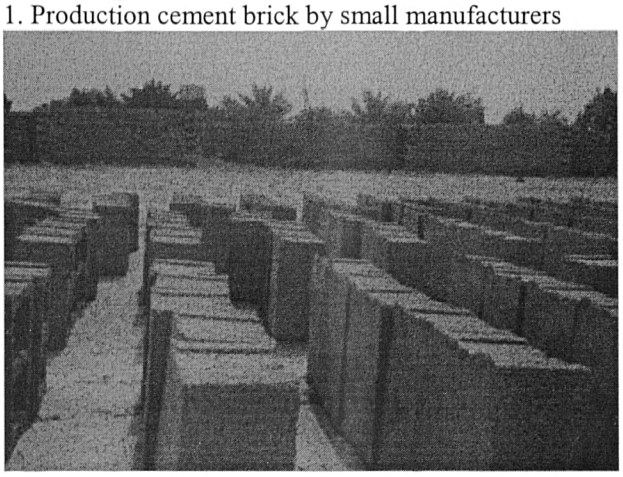


4. Imported clay brick and informal workers, Tripoli.

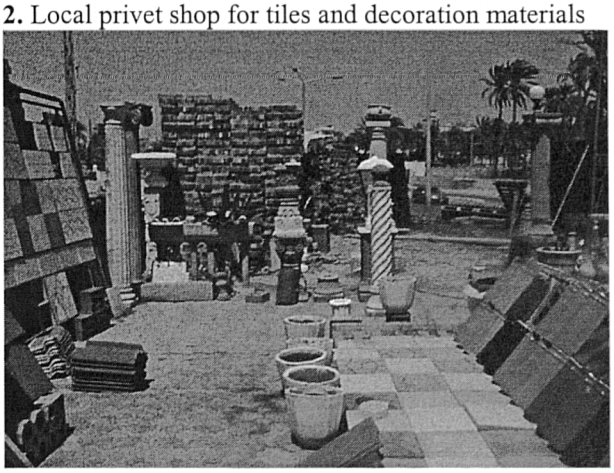
5. Direct distribution of clay brick, Janzur factory.

Distribution of constriction materials in Tripoli city

1. Production cement brick by small manufacturers

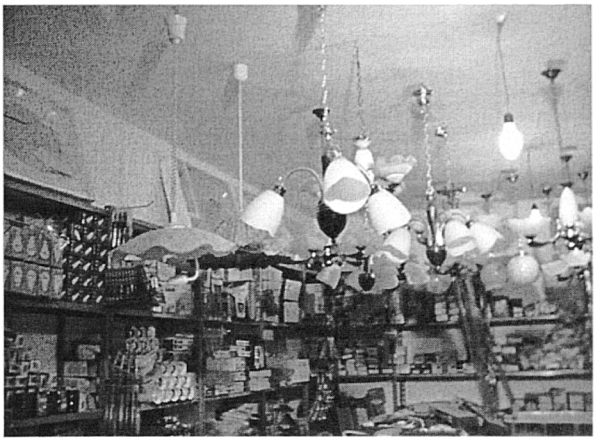


2. Local privet shop for tiles and decoration materials



3. Local private shop for sanitary fittings,

4. Local private shop for electrical components

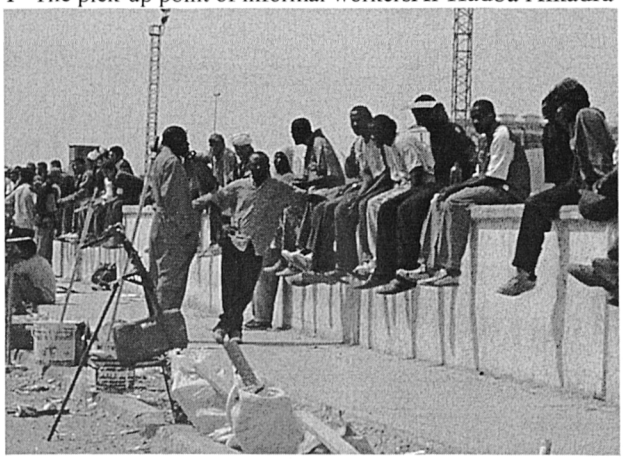


5. Local private shop for coating and painting materials

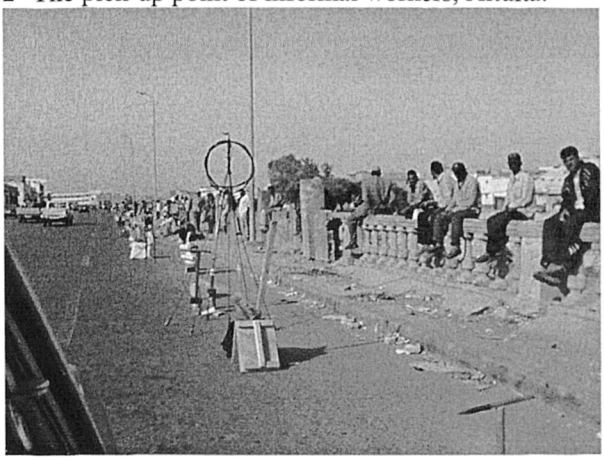
The visual survey showed that the majority of construction materials are based on cement and its related products. Also, it is observed that Libya lacks an electrical and sanitary fittings industry. The majority of sanitary fittings (toilets, baths, sink taps, etc.) and electrical components are imported from international markets.

Labour: pick-up point of informal workers in Tripoli

1- The pick-up point of informal workersAl-Hadba Alkadra



2- The pick-up point of informal workers, Altulta.

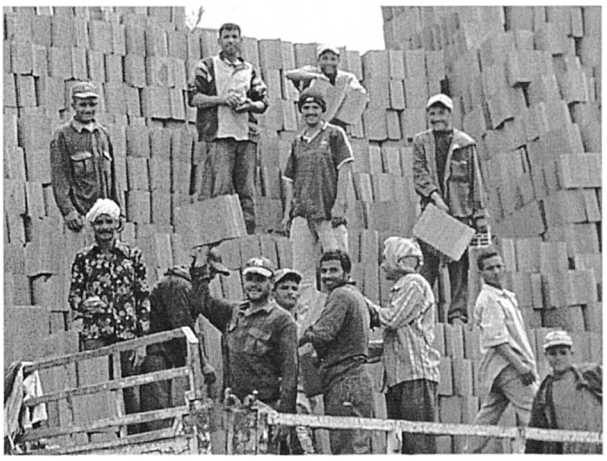


3- The pick-up point of informal workers, Ahadsh Uniuo.

Experience and observation throughout the different phases of the empirical research show that, informal workers are a key feature of Libya's construction market. At the time of the study, Souk-Altulta, Al-Fernage, Taric-Ahadsh Uniuo and Al-Hadba Alkadra were the most significant pick-up points for informal construction workers in Tripoli city. The informal sector has a key role in production processes and the supply of labour, materials and other services.

4- Informal sector produce and supply materials.

5- Loading of clay bricks by casual informal workers.



Indirect Observation for Souk-Altulta pick-up point for informal construction workers
Date of observation: 23.03.04...Time:8-11.30 am

At the time of this study, the most important pick-up point for informal construction workers was Souk-Altulta which is located in the heart of Tripoli city. It was the biggest pick-point in terms of size and numbers of informal workers. Souk-Altulta is regarded as the largest market for construction materials and small workshops in Tripoli city and its region. It was observed that the informal workers from different nationalities such as Egypt, Tunisia, Syria, Sudan, Morocco, Ghana, Nigeria etc. gathered at this point.... They came between 7 and 8 am every day in hoping to be employed as causal workers in construction sites by clients and contractors. Majority of workers aged between 20 and 45 years old. It is noted that, each nationality of workers has a particular place along the main street of Souk-Altulta..... It was also observed that construction tools giving indications of each workers occupation and skills were brought by them

every day. These tools were put in front of Each worker in order to attract the gaze of clients and contractors looking for workers..... When the workers see any car stop in the area, they run quickly to gain the chance to be employed. During the observations, informal interviews were undertaken with workers. Ali,M is 27 years old (Egyptian). He indicated that he has been standing in to this pick-up point since four years.... he came from an agricultural family and his educational background was under primary certificate. He also said that over the past three years he worked as a worker, then two years later he became a mason...at the time of the study he was a supervisor and representative of a group of plastering workers....His wage was about LD 25-30 per day...Also, he indicated that he was satisfied with his work in Libya..... Kamal, S is 38 years old (Pakistani). He is an electrical technician (holding a formal certificate). It was recognized that he used to work in one of Libyan public companies but after his contract was canceled, he decided to stay in Libya..... He was also very satisfied with working in Libya and indicated that his wage was about LD 35-50 per day ... He stressed that Libyan construction market is an international training centre in construction....any foreign individuals coming to Libya could be trained and work in construction. Added to this, discussion with a group of workers showed that the workers lack legal protection...They said that, in many cases, they lost their wages and rights because they did not have contracts with clients. Also, it was observed that little consideration is given to safety issues in terms of the construction tools used and the clothes of workers.

During the observations, the following comments were made:

- There was intensive demand for informal workers at this point
- There is a problem of communication with workers who do not speak the Arabic language
- It seems that formal contractors depend on these points to obtain workers. It was observed that representatives of some formal firms collected workers
- Workers are employed casually without formal contracts

Indirect Observations for Operations on Taric Al-Mataar construction project
The Internal Investment Company
Date of observation: 18.04.04...Time: 9-12 am

At the time of this study Taric Al-Mataar construction project was one of the largest housing projects underway in Tripoli city in terms of the scale of construction activities. The project comprises the construction of more than 1200 housing flats (with eight, ten and twelve floors) and it is located in the south of Tripoli city. The Internal Investment Company (public Libyan company) operated this project. The manager and site engineers of the project were interviewed during the empirical study. Also, a set of indirect observations was made aiming to identify the general characteristics of materials, labour, equipment, plant and operations in the projects. The project is managed by a Libyan engineer (36 years old) and supported by a number of site engineers and a consultative committee. The first observation focused on the types of construction materials used in daily operations. It was recognized that cement, steel, concrete and brick were the key construction materials. Cement and steel were obtained from the state's plants...Concrete was produced by a central mixer plant. It was noted that water was treated before using it in producing concrete.....Also, due to climatic reasons and the high temperature of the water, ice was added for it in order to be suitable for producing concrete.....Added to this, water was obtained from a well which was drilled by the company on the construction site (very close to the concrete mixer). One of the site managers told us that during summer the production of concrete was carried out during the early morning or at night in order to avoid the negative impact of the high temperature on the processes of concrete production in terms of the quality and evaporation of water.

The second observation concentrated on the workers. It was observed that the majority of workers were not Libyans. It was also noted that some were Korean, because this Libyan company had an agreement with a Korean company to supply skilled workers. Only three workers were Libyans, employed as drivers..... Also, it was observed that casual workers were brought from the local market to carry out some daily work such as loading and handling of materials and cleaning work. It was noted that there were considerable amounts of wasted construction materials such as cement, steel, wood and cement brick.....According to project progress, it was expected that the project would be delayed. Shortages of cement, steel and labour were regarded by the project's managers as the most influential restrictions impeding their operations.

During this observation, the following comments were made:

- The operations are based on cement and concrete technology and foreign workers.
- Project and site managers were Libyans. However, operative workers were completely foreign.
- Water is an important issue
- Collaboration with foreign companies in terms of supply of workers
- Informal workers are employed in the project